Towards an African perspective of urban sustainability: evidence from Ghana

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List of publications

Based on abridged versions of Chapter Five and Chapter Six in this thesis, the following manuscripts have been published or are under review.

1. Anarfi, K., Hill, R.A. and Shiel, C., 2020. Highlighting the sustainability implications of urbanisation: a comparative analysis of two urban areas in Ghana. *Land,* 9 (9), 300. https://doi.org/10.3390/land9090300

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3. Anarfi, K., Shiel, C. and Hill, R.A. Citizens' perspectives of urban sustainability: a comparative study of two urban areas in Ghana**.** Under review**.**

Abstract

With over half of the world's population living in cities, rapid urbanisation has significant implications for urban sustainable development. While urban areas drive national economies and provide opportunities for improved standards of living, they also face significant sustainable development challenges which include socio-economic inequalities, increasing poverty and informal settlements, urban sprawl, natural resource depletion and environmental degradation, and climate change impacts. Therefore, assessing the interactions between urbanisation and sustainable development at the local level is fundamentally important for guiding more sustainable urban development. There is, however, limited empirical research and understanding of the interactions between urbanisation and sustainable development in Sub-Saharan Africa (SSA) due to a paucity of data on urban areas. This paucity of data is further exacerbated by the lack of a theoretical framework for evaluating the interactions between urbanisation and sustainable development due to the disparate nature of the two processes. To address the challenges highlighted above, this study applies a Driver-Pressure-State-Impact-Response (DPSIR) conceptual framework to explore the relationship between urbanisation and sustainable development in the context of Ghana, in order to make recommendations for urban sustainability, and to develop a conceptual model that could facilitate decision-making for the transition to sustainability in Ghanaian urban areas.

This study adopted a mixed-method approach which involved collecting and analysing qualitative and quantitative data. A case study strategy was adopted to derive data from both secondary and primary research, with Ghana as the overarching case study. Beneath the Ghana case study were sub-case studies which explored the interactions between urbanisation and sustainable development comparatively in two urban areas (Kumasi and Obuasi), and sustainable city development in Ghana (Appolonia City project). In order to achieve the aim of the study, published data were used to assess overall sustainable development and urbanisation patterns in Ghana. In doing so, sustainable development in Ghana was assessed based on four primary dimensions of sustainable development: (i) safeguarding long-term ecological sustainability; (ii) satisfying basic needs; (iii) promoting inter-generational equity, and (iv) promoting intra-generational equity. The following processes were followed in order to assess the interactions between urbanisation and sustainable development at the local urban level in Kumasi and Obuasi: (i) spatio-temporal analysis of land cover change was undertaken using remotely-sensed satellite data to assess landscape urbanisation, with published data used to assess demographic urbanisation; (ii) data from the literature were used to assess sustainable development based on selected socio-economic indicators which covered aspects of life expectancy, education and standard of living; and (iii) a citizen perception survey (n=624) was conducted to explore the subjective experiences of respondents in the context of urbanisation and sustainable development. To explore policy response to urbanisation and sustainable development in Ghana, the country's National Urban Policy (NUP) and Action Plan (AP) were analysed to ascertain alignment with sustainability. To assess sustainable city development (as a response to sustainable urbanisation) in Ghana, the Appolonia City project was examined to assess how it contributes to a sustainable urban form.

The findings of the study have confirmed the unsustainability of overall development and the rapid pace of urbanisation in Ghana. In Kumasi and Obuasi, the findings have confirmed that landscape urbanisation has led to significant urban expansion at the expense of natural vegetation, and consistent with national patterns of urbanisation, demographic urbanisation in the two urban areas has been rapid. As a result, the population density in Kumasi decreased from 11,491 people / km^2 in 1984 to 4,135 people / km^2 in 2019, compared with Obuasi where the population density increased from 2,569 people / km^2 in 1984 to 3,529 people / km^2. The findings have confirmed that urbanisation has contributed to improvements in some aspects of sustainable development in Kumasi and Obuasi compared with overall national performance. For example, 86% and 68% of citizens in Kumasi and Obuasi respectively had access to improved sanitation in 2017, compared with the national coverage of 15%. The findings have also established the importance of citizens' subjective experience in the context of urban sustainability and have highlighted the need to consider group differences (including gender and economic groups) in urban sustainability decision-making. In general, the findings on Kumasi and Obuasi showed that development in the two areas was unsustainable when the trade-offs between positive impacts and challenges are considered. The findings showed that Ghana's NUP provides useful initiatives to manage urbanisation in Ghana. However, in the current state, the contribution of the NUP to sustainability in Ghana's urban areas is limited. The findings showed that while the Appolonia City project contributes to sustainable city development through innovative features such as mixed land-use and solar panel designs, the overall design of Appolonia City undermines diversity and wider urban sustainability by potentially creating an elite enclave. The findings confirmed that the transition to a trajectory of sustainability in Ghana's urban areas is in a nascent stage (if a transition exists at all). The study proposes that a radical shift in policy and practice at the institutional and community levels is required to manage urbanisation at the local level into more sustainable outcomes. A DPSIR-based conceptual model is proposed to facilitate decision-making for a transition to a trajectory of urban sustainability. Overall, the findings of the study generate direct implications for policymakers in Ghana and also provide lessons for the wider SSA region.

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Declaration

This thesis is submitted in partial fulfilment of the requirements for the degree of Doctor of Philosophy (Geography) at Bournemouth University, United Kingdom. I declare that this thesis is based on my original work except for quotations and citations which have been duly acknowledged. I also declare that this thesis has not been previously or concurrently submitted, either in whole or in part, for any other qualification at Bournemouth University or other institutions.

Kwasi Peprah Anarfi
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Abbreviations and acronyms

AIDS	Acquired Immune Deficiency Syndrome
AOI	Area of Interest
AP	Action Plan
BC	Before Christ
BRT	Bus Rapid Transit
CBD	Central Business District
CDR	Crude Death Rate
CDRF	China Development Research Foundation
CPI	City Prosperity Index
CSR	Corporate Social Responsibility
DESD	Decade of Education for Sustainable Development
DETR	Department of the Environment, Transport and the Regions (UK)
DFID	Department for International Development (UK)
DPSIR	Driver- Pressure-State-Impact- Response
EEA	European Environment Agency
ECOWAS	Economic Community of West African States
EF	Ecological Footprint
EKC	Environmental Kuznets Curve
EPA	Environmental Protection Agency (Ghana)
EPI	Environmental Performance Index
ESD	Education for Sustainable Development
ETM	Enhanced Thematic Mapper
FCUBE	Free Compulsory Universal Basic Education
FDI	Foreign Direct Investment
GCIF	Global City Indicators Facility
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GNI	Gross National Income
GOG	Government of Ghana
GPI	Gender Parity Index
GPS	Global Position System
GPRS	Ghana Poverty Reduction Strategy

GSS	Ghana Statistical Service
HDI	Human Development Index
HIV	Human Immunodeficiency Viruses
HWB	Human Well-Being
ICT	Information and Communications Technology
IEHIAS	Integrated Environmental Health Impact Assessment System
IMF	International Monetary Fund
KNUST	Kwame Nkrumah University of Science and Technology
LCC	Land Cover Change
LULC	Land Use / Land Cover
LUSP	Land Use and Spatial Planning
MDG	Millennium Development Goals
MLGRD	Ministry of Local Government and Rural Development (Ghana)
MLNR	Ministry of Land and Natural Resources (Ghana)
MLP	Multi-level Perspective
MMDAs	Metropolitan, Municipal, and District Assemblies (Ghana)
MMR	Maternal Mortality Rate
MNC	Multi-National Corporation
MoT	Ministry of Transport (Ghana)
MRH	Ministry of Roads and Highways (Ghana)
NESSAP	National Environmental Sanitation Strategy and Action Plan (Ghana)
NRC	National Research Council (USA)
NUP	National Urban Policy (Ghana)
OECD	Organisation for Economic Co-operation and Development
OLI	Operational Land Imager
PTR	Pupil-Teacher Ratio
RE	Renewable Energy
RP	Reference Point
SAP	Structural Adjustment Programme
SC	Sustainable City
SD	Sustainable Development
SDG	Sustainable Development Goals
SDS	Sustainable Development Space
SES	Socio-Ecological System

SI	Sustainability Indicators
SNM	Strategic Niche Management
SSA	Sub-Saharan Africa
SSTEC	Sino-Singapore Tianjin Eco-City
SUT	Sustainable Urban Transformations
TIRS	Thermal Infra-Red Scanner
TIS	Technical Innovations Systems
TM	Transition Management
TM	Thematic Mapper
TNI	Transnational Institute
UN	United Nations
UNCSD	United Nations Commission on Sustainable Development
UNCSD	United Nations Conference on Sustainable Development
UNDP	United Nations Development Programme
UNDESA	United Nations Department of Economic and Social Affairs
UNECA	United Nations Economic Commission for Africa
UNEP	United Nations Environment Programme
UNICEF	United Nations International Children's Emergency Fund
U.S.	United States
USF	Urban Sustainability Framework
USGS	United States Geological Survey
WCED	World Commission on Environment and Development
WHO	World Health Organisation
WWF	World Wide Fund for Nature

Chapter One

1. Introduction and overview of research

1.1. Introduction

Over half of the world's population resides in urban areas (Dodman et al. 2013), and 90% of future global population growth is expected to occur in the urban areas of less-developed countries (United Nations [UN] 2014). Rapid urbanisation, arguably the most important socio-economic process of the 20th and 21st centuries, poses intractable challenges to the achievement of sustainable development (Allen 2009; Jaeger et al. 2010; Zhou et al. 2015). These challenges, which include natural resource depletion, climate change impacts, socio-economic inequalities, urban sprawl, etc., exist because the capacities of local and national governments to plan and manage the demographic transition in an efficient, equitable, and sustainable manner are generally exceeded and overwhelmed by the rapid pace of the urbanisation process (Biswas 2006). The impacts of existing structural challenges, which are exacerbated by poverty and unemployment, also mean that less-developed countries will struggle to meet the demands and difficulties of rapid urbanisation (Peter and Swilling 2012). However, the ramifications of this complex urbanisation process, especially in the global South, are still poorly understood.

The inter-linkages between sustainability, human well-being, and the function of urban areas have also attracted attention as the implications of their convergence in an era of rapid urbanisation is complex and poorly understood (Holden et al. 2008; Sassen 2011). There is a consensus that urban sustainability is pivotal for global sustainability (Bugliarello 2006; Walsh et al. 2006; Allen 2009; Fang et al. 2016) and recognition that research to explore the interactions between urbanisation and sustainability, in order to enhance understanding of the (un)sustainability of rapid urbanisation, is necessary.

For Sub-Saharan Africa (SSA), ongoing and future urbanisation requires the formulation of sustainability strategies to address present and future challenges, and to secure the integrity of urban systems. For example, as a region which relies heavily on the extraction of mineral resources to fuel national development, there is a potential risk that Africa's path to growth will fail to align with urbanisation and sustainable development, as it is believed that

resource-based growth is not naturally urban-oriented (United Nations Economic Commission for Africa [UNECA] 2012a; Turok and McGranahan 2013). Thus, from a resource-economy perspective, strategic efforts will be required in order to maximise the developmental benefits of Africa's urbanisation (Turok and McGranahan 2013) and to enhance sustainable development in African urban areas. However, the quest for urban sustainability strategies in Africa is undermined by an inherent paucity of data on urban systems (Smit and Parnell 2012), a situation made worse by the politically-charged nature of urbanisation in most SSA cities (Pieterse 2008; McGranahan et al. 2009; Jones and Corbridge 2010; Parnell and Simon 2010). Therefore, there is a need for fresh-thinking in order to understand the synergies and tensions between the urbanisation process, the resultant demographic and economic shifts and their implications for sustainable development, in a way that takes the unique conditions in SSA into account.

At present, empirical evidence on the extent and nature of the interactions between the processes of urbanisation and sustainable development in Africa is limited. Consequently, the trans-disciplinary nature of sustainable development as a concept means that the lack of a comprehensive framework of evaluation (Jabareen 2008) potentially undermines an understanding of the complex inter-relationships between the sustainable development and urbanisation processes. Therefore, this study aims to holistically re-embed an understanding of the dynamics of contemporary urbanisation within the context of sustainable development, with a view to making recommendations for a transition towards urban sustainability in Africa. To achieve this, a targeted case study in an African country, that investigates the characteristics of the urbanisation process and how it interacts with the sustainable development process, can hopefully provide a clear understanding of the general trend of (un)sustainability of urbanisation in African cities. An empirical study is presented hereafter to expand scientific knowledge which is organised mainly around the trends of urbanisation and the operationalisation of sustainable development as a concept in both policy and praxis in Ghana. Thus, this chapter highlights the context of the study with an explication of the background to the research topic. The motivation for this study is then presented. Following this, an outline of the research aim, specific objectives, and the research questions for this study are presented. The chapter concludes with an outline of the remaining chapters in this thesis.

1.2 Background

1.2.1 Urbanisation: trends, contributory factors and impacts.

Urbanisation is not a new phenomenon, but has over the last two decades re-emerged in critical international debates due to the rapid rate at which it is occurring and influencing change at local, regional, and global spatial levels. It has been defined by Cobbinah et al. (2015a, as cited in Cobinnah and Niminga-Beka 2017, p.1) as a "*demographic, ecological, sociological and economic phenomenon that concentrates population in urban areas and has the potential to either fuel or impede growth and development of these areas".* The main factors driving urbanisation or urban expansion include, but are not limited to, natural population increase, rural-urban migration, reclassification of rural areas as urban areas, and when people move to urban areas from other (often smaller or less prosperous) urban areas or from abroad (Sporrek 1985; McGranahan et al. 2009; Jedwab et al. 2017). Natural population increase refers to the excess population as a function of the rates of birth and death (Cobinnah et al. 2015a) and may result in congested urban areas (Jedwab et al. 2017). Rural-urban migration is explained through the notions of 'rural-push' and 'urban-pull' factors (Jedwab et al. 2017). Rural-push factors, in the African case, could be the result of poverty due to landlessness, natural disasters, and conflicts (Barrios et al. 2006; da Mata et al. 2007; Henderson et al. 2013). Urban-pull factors may affect migration flow through industrialisation and associated wage incentives (Lucas 2004; Henderson et al. 2013), urban-biased government policies which boost utility provision (Davis and Henderson 2003), and the provision of goods and services through resource rent spending in natural resource exporting economies (Gollin et al. 2013; Jedwab 2013; Cavalcanti et al. 2014). All these factors may draw populations into urban areas. Furthermore, the rate of urbanisation increases when the boundaries of a previously rural area are expanded and classified as urban (Satterthwaite et al. 2010).

Empirical projections have estimated the world's urban population at about 6 billion people by the year 2050 (see Table 1.1). Out of the total, developing countries are expected to be home to about 5 billion urban citizens, with the remainder housed in developed countries. In the global South, SSA and Asia are projected to dominate future urban growth with over 55% of their respective populations living in urban areas by 2050, an increase on the 2010 levels of between 40% to 45%. In absolute numbers, Asia is expected to have about 3.3 billion urban residents at an average annual urbanisation rate of 1.46% by 2050, while SSA will

house about 1.3 billion urban citizens at an average annual urbanisation rate of 2.87% (Cobbinah and Aboagye 2017). The projected figures suggest a substantial demographic shift which will have profound socio-economic transformation and ecological impacts, especially in less-developed regions of the world where urban growth is usually uncoordinated, fragmented, and originates from multiple nuclei (Duh et al. 2008).

Table 1.1: Global urban population distribution.

Region	Population ('000)				Urbanisation Level (%)				Urbanisation rates (%)		
	1950	2000	2010	2050	1950	2000	2010	2050	1950-2000	2000-2010	2010-2050
World	745,495	2,858,632	3,558,578	6,252,175	29.44	46.69	51.60	67.18	2.69	2.19	1.41
Developed Countries	441,845	881,344	957,251	1,127,222	54.47	74.14	77.45	85.93	1.38	0.83	0.41
Developing Countries	303,650	1,977,289	2,601,326	5,124,953	17.64	40.08	45.96	64.11	3.75	2.74	1.70
Asia	245,052	1,392,232	1,847,733	3,309,694	17.46	37.44	44.37	64.36	3.47	2.83	1.46
Europe	280,602	514,545	536,611	591,041	51.27	70.80	72.69	82.17	1.21	0.42	0.24
Latin America and the Caribbean	69,264	393,619	465,246	650,479	42.38	75.49	78.84	86.62	3.48	1.67	0.84
Northern America	109,667	247,911	282,480	395,985	63.90	79.13	81.99	88.61	1.63	1.31	0.84
Oceania	7,907	21,924	25,857	40,346	62.38	70.43	70.66	73.05	2.04	1.65	1.11
Africa	33,004	288,402	400,651	1,264,629	14.36	35.56	39.19	57.70	4.34	3.29	2.87

Source: Cobbinah and Aboagye 2017 as adapted from Cobinnah et al. 2015 a/b, UNDESA/PD 2012.

Rapid urbanisation can act as a double-edged sword for human well-being, serving as both a blessing and a curse. If managed well, urbanisation can potentially be a springboard to prosperity (especially in less-developed countries) through increased opportunities in life, as well as through social and cultural freedoms for the urban populace (Earle 2016). For example, urbanisation is associated with improved living standards and increased access to utilities such as health facilities and employment opportunities (Gong et al. 2012; Turok and McGranahan 2013). Evidence from research suggests that uncoordinated rapid urbanisation

produces negative environmental and social impacts and contributes to global environmental change (see Bengtsson et al. 2006; Grimmond 2007; Parnell et al. 2007). For example, urbanisation is linked to energy emissions (with CO_2 emissions being prominent) through agricultural modernisation, construction activities, transportation systems, as well as increased residential energy use (Ouyang and Lin 2017). An estimated 71% of energy-related greenhouse gas (GHG) emissions have been attributed to cities (Hoornweg et al. 2011). This implies that unplanned and rapid urbanisation could lead to increased GHG emissions and thereby contribute to climate change. Urbanisation also alters the urban socio-economic status and social structures, and has been linked to the spread of both communicable and non-communicable diseases (Gong et al. 2012).

1.2.2 Urbanisation in Africa.

Described evocatively as an 'urban revolution' by Grant (2015), the past few decades have seen an unprecedented increase in the scale and scope of urbanisation in SSA. This 'urban revolution' started on the back of decades of structural adjustment policies and economic stagnation in African countries and resulted in an extensive movement of people to cities in search of better opportunities. The potentially pernicious effects of rapid urbanisation on urban environments in Africa, including resource depletion and pollution due to the intensity of anthropogenic activities and population density, have also been captured in the literature by some scholars (see, for example, Bao and Fang 2012; Cobbinah et al. 2015a). With Africa expected to accommodate about 1.3 billion people of the global urban population in 2050 (UNDESA / PD 2012), it has been predicted that the continent faces potential challenges of increasing vulnerability and insecurity, effects of climate change, energy-related problems and general ecological destruction (World Economic and Social Survey 2013; Darkwah and Cobbinah 2014; Cobbinah et al. 2015a).

A striking feature of urbanisation and urban development in SSA since the 20th century has been the influence of colonialism. Scholars such as Iliffe (2007) and Fox (2012) have discussed how colonialism promoted urbanisation and urban growth through the introduction of institutions and technologies which facilitated improvements in mortality rates and food security. However, as Fox (2012) further argues, the colonial legacy of underinvestment resulted in the lack of physical and economic capacities to enable SSA cities to accommodate the influx of people attracted to the urban areas in the post-independence era. The unique

political and economic factors associated with colonialism also ensured that any form of development (as would drive urbanisation) was based on Western models and primarily aimed at serving the interests of colonial masters (Boon 2009).

Urbanisation is seen as pivotal to the economic development processes in countries as it triggers a shift from a rural agrarian society to an urban-industrial one (Davis and Henderson 2003). With industrialisation as a driving factor (Schnore 1961), urbanisation is inextricably linked to the economic development process (Davis and Golden 1954). Extant literature on urbanisation in Africa (for example, Fox 2011), however, point to a historically weaker relationship between urbanisation and economic development than witnessed elsewhere in the world. Put simply, it is argued that SSA is experiencing 'urbanisation without development' as the rate of urbanisation is not commensurate with the level of industrialisation (Turok 2013). This diagnosis is borne out of the reality that developmental growth in the majority of countries in SSA is mostly based on the extraction of natural resources including oil, gas, and mineral ores (Turok and McGranahan 2013). Between 2000 and 2008, natural resource extraction and related spending are estimated to have contributed to about 30% of Africa's Gross Domestic Product (GDP) growth (Mckinsey and Company 2010). However, the interplay between resource extraction and the associated urbanisation process has been largely ignored (Bryceson and Mackinnon 2012; Gough et al. 2013).

More relevant in the SSA context is the reality that urbanisation challenges in SSA are coupled with and aggravated by the issues of poverty and increasing informality[1] in the urban space (Afranie and Ahiable 2011; UN-Habitat 2014). To an extent, the UN-Habitat (2008, p.106) once described Africa's urbanisation process as a "*widespread poverty-driven economic survival strategy"*. Furthermore, a World Bank Report (2000, p.130) noted that *"Africa's pattern of 'urbanisation without growth' is in part the result of distorted incentives that encouraged migrants to exploit subsidies rather than in response to opportunities for more productive employment"*. Contrary to other less-developed regions where the majority of urban poor reside in smaller cities, Coulombe and Lanjouw (2013) show that the majority of urban poor in Africa reside in its big cities. In fact, a greater proportion of the landscape

1 As a by-product of poverty, informality, in this context, refers to the range of businesses, individuals, and activities that accrue benefits by producing goods and services outside established legal and regulatory frameworks (de Soto 1989; Bruton et al. 2012).

and demographic change in Africa has taken place in the form of slums, and in unplanned shanty towns where poverty is pervasive and access to essential services is limited (Pauleit et al. 2018). Over half of the urban population in Africa live in slums (i.e. developments that are usually not captured by urban development plans) that remain outside the coverage of municipal services (Cities Alliance 2008). The proliferation of slums in African cities alters the configuration of urban landscapes, and the appalling conditions that prevail in such places are an affirmation of the inability of the cities to cope with the pace of urbanisation (Locke and Henley 2016). By using poverty as a measure, the literature has attributed a reduction in poverty levels across the world to the economic growth that is derived from the agglomeration effects of urbanisation. For example, according to a study on new evidence for the urbanisation of poverty by Ravallion et al. (2007, p.27), "*the urbanisation process has played a quantitatively positive role in overall poverty reduction by providing new opportunities to rural out-migrants (some of whom escape poverty in the process) and through the second-round impact of urbanisation on the living standards of those who remain in rural areas"*. While not denying the economic benefits due to urbanisation in Africa, some studies have argued that the process has not resulted in wholesale economic gains as witnessed in developed economies in the past (Chang 2009). For example, according to an international study on urbanisation and poverty in Africa, *"there is generally an unequivocal (positive) correlation between urbanisation and economic development and growth, but in Africa, this appears not to apply"* (Kamete et al. 2001; as cited in Njoh 2003, p.169). This stance was reinforced by the study of Ravillion et al. (2007, p.27) whose position on Africa, based on their study, was that: "*the pattern of falling poverty overall is far less evident in Sub-Saharan Africa, where the population (including the poor) has been urbanising, yet with little reduction in aggregate poverty"*. As a result, some writers have described the continent's urbanisation as demographic, rather than economic (Gould 1998; Songsore 2003; Songsore 2009). Demographic in the sense that it has prematurely resulted in a significant increase in the number of urban centres and people in response to push factors, such as rural droughts, conflicts, and falling agricultural prices, rather than economic agglomeration effects (Commission for Africa 2005). Others (for example, Njoh 2003; Kessides 2007) have contested the notion that the SSA urbanisation process does not deliver economic development. For example, Njoh (2003) established a positive relationship between urbanisation and economic growth in 15 out of the 24 SSA countries in her study. Others have, however, taken a balanced view. For example, according to a study that modelled the impact of accelerated urbanisation in Africa on economic growth, poverty, and migration by

Dorosh and Thurlow (2012, p.24), the authors concluded that *"...urbanisation and agglomeration economies are important sources of economic growth and might well be a driver of long-term structural transformation in Africa. However, over the short-term, investing in major cities does little to address national poverty"*. What can be inferred from the studies above is that while agglomeration from the urbanisation process in SSA delivers benefits, the nature (i.e. pace) of the process means that, in the short-term, the economic benefits are modest and the impact is limited (Turok and McGranahan 2013). Accordingly, from a demographic perspective, Ferguson (1999) has suggested that population urbanisation should be conceptualised as two distinct and independent processes of natural population growth and migration, for which the likelihood of either becoming the most important component of urbanisation is primarily determined by the prevailing economic conditions. In the context of migration, Potts (2016, p. 261) has also argued that *"migration rates go up when [urban] employment is being generated but are not sustained in the face of strong negative changes in urban economies, incomes and condition; they change in logical ways and according to the basic precepts of standard neo-classical migration theory"*. Thus, these findings on the variable relationship between economic growth and urbanisation in SSA provide a context for a deeper understanding of the practical realities of the interaction between urbanisation and economic growth.

The discussion above is an indication that a salient feature of Africa's urbanisation is the incidence of poverty, which has far-reaching implications for achieving sustainable development. While urbanisation has brought new economic, political, and cultural opportunities for the urban populace in SSA to enhance their livelihoods, this transformational process has also been accompanied by social challenges and threats to the ecological integrity of urban environments. Despite these trends, the consequences of this complex urbanisation process in SSA are still poorly understood, and surprisingly little systematic comparative research has been devoted to understanding the dynamics of the relationship between urbanisation and sustainable development in a holistic manner. This requires conducting research in order to help gather policy-relevant data, experiences, and knowledge resources which could potentially lead to the formulation of much-needed interventions.

1.2.3 Progress towards sustainable development in Africa.

Sustainable development (SD), as a concept, emerged in the 1980s (du Pisani 2006) as a point of reference for a new development paradigm that attempts to rethink development by incorporating environmental concerns in the pursuit of socio-economic development (Hopwood et al. 2005). From the Brundtland Report, SD is the process of pursuing "*development that meets the needs of the present generation, without compromising the ability of future generations to meet their own needs"* (World Commission on Environment and Development [WCED] 1987, p.8). The above description of SD unequivocally suggests that its achievement will involve a complex mix of social, economic, cultural, political, legal, and environmental actions (Ait-kadi 2016). The United Nations Conference on Sustainable Development (UNCSD) in Rio de Janeiro in 1992 marked the start of the global adoption of sustainable development as a concept and introduced AGENDA 21 as a way of incorporating and implementing SD in countries. The subsequent years have seen the introduction of the Millennium Development Goals (MDGs) in 2000, and the Sustainable Development Goals (SDGs) in 2015, with both providing sets of goals, based on which countries formulated and enshrined SD principles in policies and legislation.

Narrowing the focus from the global level to Africa, it has to be understood that the notion of development on the continent can best be described as 'problematic' as it has been shaped by colonial legacies which resulted in dysfunctional boundaries, exploitation, skewed development, and underdevelopment; situations which were further exacerbated in the post-colonial era by authoritarian regimes which mostly mismanaged and promoted elite-capture of State resources, thereby leading to pervasive poverty for the masses (Cloete 2015). The prospect of achieving sustainable development in the region is, thus, influenced by a range of issues including general socio-economic characteristics, cultural, and regional considerations. A report by the United Nations Economic Commission on Africa in 2012 reflected on Africa's mixed progress towards sustainable development. For example, the report (see UNECA 2012b) notes that there has been significant economic growth performance in African countries as over half of the top ten fastest growing economies in the world during the decade preceding the report were from Africa. At the same time, one statistic in the report emphasised the pervasiveness of poverty in Africa as the number of poor people in the region rose from 268 million to 306 million in the decade preceding the report (i.e. 2001-2011). Inequality in wealth distribution increased as African countries ranked poorly in the United Nations Development Programme (UNDP)'s adjusted Human Development Index (HDI). Universal primary education targets were on course to be reached, although improvements in

the quality of education were critical in some areas, and there were significant efforts aimed at empowering women. Food security and hunger challenges are critical, as food prices at the time of the report were higher than at any time since 1984. Also, unemployment in Africa is still an issue as the report showed that over 60% of the youth were unemployed, with the majority living on less than U.S.$ 2 a day. Improvements have been made concerning access to water and sanitation. Significant progress has been made to reduce maternal mortality and the fight against diseases such as malaria, tuberculosis, and HIV/AIDS. Furthermore, Africa is not a significant emitter of GHGs and, thus, contributes little to ongoing climate change (Schwerhoff and Sy 2017). However, Africa's rapidly growing population will increase energy consumption and thus requires development strategies that do not disregard the environment, but rather contribute to effective mitigation of climate change and its impacts (Schwerhoff and Sy 2017).

Despite ongoing international and national efforts, SD remains elusive for Africa due to less-favourable conditions and extensive developmental backlogs (Cloete 2015). Given the reality that nations in Africa are among the least-developed in the world (Freitas 2013), and the continent has experienced massive population growth (Cobbinah et al. 2015a), the question thus arises: is the evidence of contemporary trajectories of development practice consistent with the principles of sustainable development in Africa? There is a need to ensure that developmental strategies are aligned to the principles of SD, and this will require systematic monitoring, measurement, and evaluation of issues relevant to SD. However, like many other less-developed regions, the stark reality for Africa has been the lack of reliable and quality data, making the idea of effective sustainable development performance evaluation at best, rhetoric (Cloete 2015).

1.2.4 Towards a sustainable world: sustainable urbanisation as a pathway to urban sustainability.

The trends and impacts of the rapid urbanisation process have implications for sustainable development (Wu 2014). On the one hand, there is the notion of urban sustainability which denotes a desirable state of an urban society which has been developed to meet the needs of people in a way that avoids unacceptable social and environmental impacts (Hamilton et al. 2002). On the other hand, is the notion of sustainable urbanisation which characterises the processes through which the earlier-described desirable state can be reached (Zhang 2016).

Recognised as an essential part of SD (UN-Habitat / DFID 2002), sustainable urbanisation has been defined as a dynamic process of urban development within which environmental, social, economic, and governance issues are given equal attention (Shen et al. 2011). Essentially, urban sustainability is considered as an intersection between the notions of sustainability and urbanisation (Bugliarello 2006) and can be viewed from the utopian lens of a 'sustainable city', which according to Whitehead (2003, p.1188) *"represents an economic space within which the social, economic and ecological contradictions of capitalism are being managed and strategically addressed"*. Accordingly, there is a renewed understanding among stakeholders, including governments and international organisations, on the centrality of urban areas towards the goal of a sustainable global future. This is reflected in the recently-agreed SDGs, as the 11th of the 17 goals formulated aims to *"make cities and human settlements inclusive, safe, resilient and sustainable"* (United Nations 2015, para.1). For SSA (one of the poorest regions in the world [UNECA 2012b]), achieving SD will require the dynamic and rapid urbanisation process to be consistent with the principles of sustainable development.

1.2.5 Concluding comments on background.

The exigency for sustainable urbanisation in SSA is necessitated by the rate and scale of current and projected urbanisation in the region. Urbanisation is expected to challenge sustainable development as pressure is exerted on immediate and surrounding environments and the locus of poverty shifts to expanding and new urban areas. The rapid and irreversible pace of urbanisation in SSA requires effective and pragmatic policy responses to enable the continent to capitalise on this demographic shift, rather than create a pernicious trap for future generations in SSA. While stakeholders, including governments, international organisations, and individuals, agree that sustainable urbanisation in the context of sustainable city development is desirable, there is limited empirical evidence to guide this shift, or to suggest the form it should take, especially for geographic regions such as SSA. The literature reviewed in Chapter Two is replete with evidence of the sustainability strategies and approaches implemented in cities across the globe (mainly in more-developed nations). Differences in economic, political, social, and environmental conditions across countries, however, mean that it would be difficult to replicate strategies from one country to another. In essence, 'one size fits all' solutions to sustainability offer little or no flexibility to cities of the global South where resources for development are often limited. A fundamental

argument of this study, therefore, is that the myriad of approaches has not coalesced into solutions that fully consider the place-specific conditions in regions such as SSA, where poverty is prevalent and institutional structures are weak. As an initial step, it is critical to conduct a place-specific examination on the state of contemporary urbanisation and the state of (un)sustainability in African urban centres in order to help identify solution-oriented interventions for transformational change.

1.3 Motivation for this research

The motivation for this study is premised on the following. First, global urbanisation is proceeding at a rapid pace and it is creating intractable challenges for sustainable development in urban areas (Allen 2009; Zhou et al. 2015). Second, in Sub-Saharan Africa, the situation is exacerbated by the reality that urbanisation is proceeding at a pace that exceeds the capacities of local and national governments to plan and manage the demographic transition in an efficient, equitable, and sustainable manner (Biswas 2006). Third, there is a generally-poor understanding of the interactions between urbanisation and sustainable development in SSA due to the paucity of data on African urban areas (Smit and Parnell 2012). Thus, the main motivation for this study is premised on a desire to understand and produce new knowledge on the current patterns of urbanisation and the characteristics of the sustainable development process in the urban areas of SSA. It is based on the realities outlined above that this study intends to explore evidence from Ghana in order to explicate the interactions between urbanisation and sustainable development in the SSA context. Ghana provides an important case study for two main sets of reasons. First, urbanisation is proceeding rapidly in Ghana and has resulted in over half of the population residing in urban areas since 2010, a situation that has created challenges for achieving sustainable development in Ghana's urban areas. At an annual growth rate of 3.4%, rapid urbanisation in Ghana has complicated the government's capacity to provide basic infrastructural and social services (Farvacque-Vitkovic et al. 2008; Okeke 2014). Second, the country has successfully formulated and implemented a National Urban Policy (NUP) to guide sustainable urbanisation in Ghana's urban areas. Essentially, the expectation is that recommendations can be drawn from this study in order to inform policy-making and to identify solutions for transformational change in order to ensure that urbanisation proceeds within a trajectory of positive sustainable development.

1.4 Research aim, research questions and specific objectives

A keystone of this research is to provide evidence-based proposals to facilitate urban sustainability transitions that emanate from the findings of the analyses of place-specific areas in SSA, and which take into context the developmental characteristics and conditions prevailing in these areas. Thus, the main aim of this study is to explore the relationship between urbanisation and sustainable development in the context of Ghana, in order to make recommendations for urban sustainability, and to develop a conceptual model that could facilitate decision-making for the transition to sustainability.

1.4.1 Research questions.

In order to realise the research aim, the following research questions are posed:
(a) What are the dynamics of the interactions between urbanisation and sustainable development at the national and local urban levels in Ghana, and how can the interactions be assessed?

(b) What are the policy and development responses to rapid urbanisation in Ghana, and how do the responses align with the visions and principles of sustainability?

(c) How can decision-making for a transition to a trajectory of urban sustainability in Ghana be facilitated?

1.4.2 Specific objectives.

(1) To apply a conceptual framework that organises the interactions between urbanisation and sustainable development in an integrative and holistic manner.

(2) To evaluate the urbanisation trends and the sustainable development situation through an overarching case study of Ghana.

(3) To provide a deeper understanding of the Ghanaian situation through a comparative urban sub-case-study (Kumasi and Obuasi) that specifically: (i) examines the patterns of landscape and demographic urbanisation and the implications for sustainable development; (ii)

evaluates the sustainable development situation based on recognised indicators from the literature; and (iii) explores urbanisation and sustainable development in Ghana based on the subjective experience (perceptions) of citizens.

(4) To examine the sustainability construct and operationalisation in Ghana's urban policies in order to determine their consistency with the principles of sustainable development.

(5) To examine sustainable city development in Ghana through a sub-case-study (Appolonia satellite city) in order to establish the extent to which it aligns with sustainability as a concept.

(6) To suggest recommendations for urban sustainability transition, and to develop a conceptual model that could facilitate and enhance evidence-based decision-making for the transition to urban sustainability in Ghana, and by extension, SSA.

1.5 Structure of the thesis

Following this introductory chapter, the remainder of this thesis comprises a further seven chapters (Figure 1.1). These are briefly outlined as follows:

Chapter Two provides a critical review of the existing literature to guide this research. The first five sections of the chapter discuss relevant literature related to urbanisation and sustainable development in a way that establishes the area of the research and the research gaps addressed in this thesis. The sixth section introduces relevant theories and concepts that provide a foundation upon which a conceptual research framework for understanding urbanisation and sustainable development in Ghana is proposed.

Chapter Three presents the broad methodology and specific aspects of the methods used to answer the research questions. The philosophy underpinning this research (i.e. pragmatism) is highlighted. This is followed by a discussion of the research strategy and the methodological choices made. Other issues including ethics and data collection are discussed.

Chapter Four is the first of four chapters which present and discuss the findings. Chapter Four is the overarching case study in this thesis, and it critically assesses overall sustainable

development and urbanisation in Ghana. The first part of this chapter presents an overview of urban challenges, as well as key factors that influence urban development in Ghana. The second part considers the overall sustainable development situation in Ghana as consistent with the sustainable development principles of providing basic needs, as well as the fairness of development expressed in terms of inter-generational and intra-generational equity. The third part of the chapter considers the overall urbanisation situation in Ghana, including driving forces, and links them with issues such as economic growth. This chapter concludes by discussing the sustainability implications of contemporary urbanisation in Ghana.

Chapter Five presents the findings and discussions on a sub-case-study that comparatively explores the interactions between urbanisation and sustainable development in two urban areas of Ghana (Kumasi and Obuasi). The first section presents findings and discussion on demographic and landscape urbanisation and the implications for sustainable development in the two urban areas. The second section presents findings and discussion on the assessment of sustainable development based on selected socio-economic indicators in the two urban areas. The third section presents findings and discussion on the subjective experience of citizens in the context of urbanisation and sustainable development, which is explored through a quantitative survey of the perceptions of citizens.

Chapter Six is a critical review of the National Urban Policy and Action Plan which have been formulated and promoted to manage urbanisation in a way that leads to the sustainable development of Ghana's urban areas. The chapter considers sustainability within the documents reviewed and identifies and discusses the challenges to the operationalisation of sustainability in the policy documents.

Chapter Seven presents the findings and discussions on a sub-case-study (Appolonia City) that explores sustainable city development in Ghana. It is worth noting that the Appolonia City sub-case-study was not part of initial study design. However, after considering the initial findings from the comparative case-study on two urban areas and the urban policy analysis, and recognising the importance of sustainable city projects as evident in the literature, it became necessary, therefore, to explore whether Appolonia City is a demonstrable exemplar of practical efforts being made to promote urban sustainability in Ghana. Furthermore, Chapter Seven identifies barriers to sustainable city development in Ghana. It presents discussions on strategies for urban sustainability transition in Ghana. It concludes by

proposing a conceptual model that could facilitate evidence-based decision-making for the transition to urban sustainability in Ghana and by extension, SSA.

Chapter Eight provides conclusions and recommendations for the study. It discusses the extent to which the research questions have been answered and how the primary aim and objectives have been fulfilled. The contributions of this study to knowledge are outlined, limitations are outlined, and suggestions for future research are made.

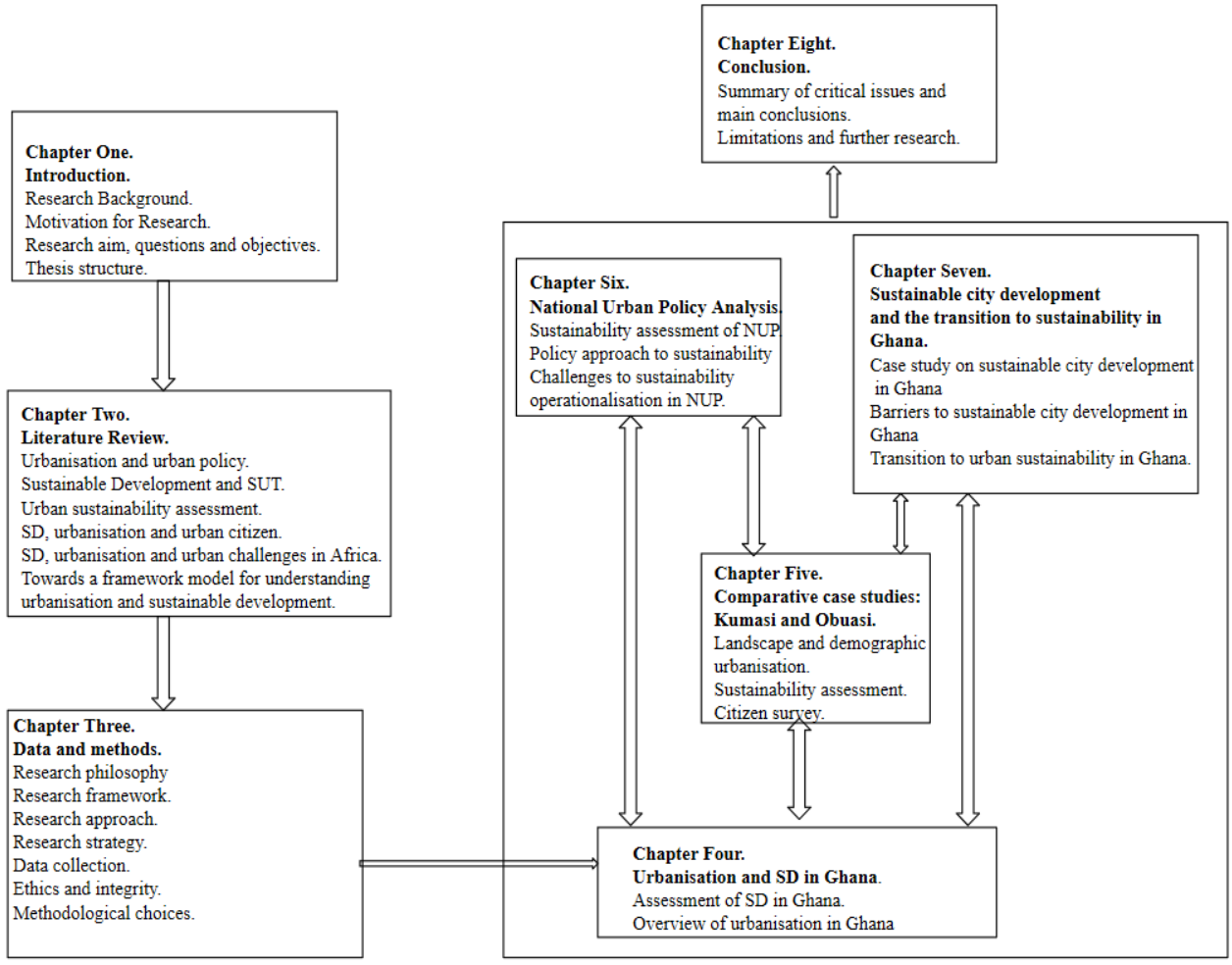

Figure 1.1: Overall thesis structure and integration of chapters.

Chapter Two

2. Literature Review

2.1 Introduction

This chapter examines key literature and theories related to the main themes of the study in order to enable an understanding of the complexity of the interactions between urbanisation and sustainable development to be developed, with a view to providing an appropriate research framework. The remainder of this chapter proceeds in five sections. The first four sections provide a review of literature with an expectation that it will help to identify gaps in research related to the urbanisation and sustainable development processes, especially in the SSA context. The fifth section addresses scholarly and methodological issues in order to support the focus of this study and provide the foundations based on which a research framework is proposed.

2.2 Urbanisation and urban policy

2.2.1 Urbanisation.

Defining urbanisation from various perspectives and applying such definitions in an appropriate way is important in order to gain a holistic understanding of the process and its role as one of the central themes in this research. In statistical terms, urbanisation can be described as the proportion of a country's population living in well-defined urban areas (Gough et al. 2013). From a demographic perspective, urbanisation has been described as an increasing share of a population that dwells in urban areas (Poston and Bouvier 2010). From a land use perspective, urbanisation has been described as a process whereby land is converted from a previous state into an urban built-up area (Fang et al. 2016). Thus, a presumption within this thesis is that the inexorable process of urbanisation is as much a social process as it is a spatial, physical or economic process due to its overarching influence on factors such as societal organisation, as well as demographic and landscape characteristics. Others have also described urbanisation as a transformation of the population in a region from a rural to an industrial way of living (Firman et al. 2007). At the very fundamental level, what is meant by the word 'urbanisation' is the level of urbanity in a geographical region.

2.2.2 What is 'urban'?

There is no universal definition of what makes a place urban. Determining what makes an urban area mainly involves using criteria which are based on either an economic or a geographic approach (OECD and CDRF 2010). In a geographic approach, density is considered as the main criterion for urbanity, where population and housing are the units of analysis. An economic approach uses thresholds of the agricultural workforce in an administrative unit. Some scholars have, however, defined 'urban' in ways that cut across both the economic and geographic spheres. According to Albala-Bertrand (2003, p. 75), an urban area is *"a set of infrastructures, other structures, and buildings that create an environment to serve a population living within a relatively small and confined geographic area"*. Depietri et al. (2012) have identified three classifications of urban areas based on (i) population size (where a threshold number is set, for example, > 2000), (ii) agricultural workforce (for example, the proportion of population engaged in agriculture rather than non-agricultural activity), and (iii) administration (for example, the type of local government). Nevertheless, what constitutes an urban area differs among countries, and it is determined by the approach or definition adopted by a particular country. In general, it is recognised that comprehensive international comparisons of urbanisation rates can be difficult to achieve while 'urban' definitions remain country-specific.

2.2.3 Global urbanisation.

Seto et al. (2013) have discussed the variations in the global pattern of urbanisation. Citing the examples of India, Russia, and Brazil, they argue that there is no single 'urban transition' as the rates and periods of urbanisation, land use patterns, and environmental conditions sharply differ between and within countries. For instance, Brazil reached 36% urbanisation in 1950, while India's urbanised proportion was only 31% in 2011 (Government of India 2011). In an intra-country context, Russia's urbanisation depicts one of disproportionate urban primacy as the process resulted in the creation of huge urban areas (Becker et al. 2012). From a temporal perspective, Seto et al. (2013) observe that contemporary global urbanisation varies tremendously from past urbanisation in ways that include scale, rate, and shifting geographies of urbanisation. For example, the scale of urbanisation in contemporary times is enormous as there are over twenty cities in the world with populations of ten million or more, when there was none in 1900. The scale of urbanisation leads to the creation of a hierarchy of

cities where differences in city sizes influence the available opportunities for improved life (Tselios 2014). Scott and Storper (2003, p.581) reinforce this idea as they suggest that *"large cities are locomotives of the national economies within which they are situated, in that they are the sites of dense masses of inter-related economic activities and offer a wider and better quality of the producer services that are essential to technological innovation*". Thus, as McCann and Shefer (2004) have noted, large cities (for example, capital cities and metropolitan regions) are shaped by urbanisation economies, while small cities are shaped by localisation economies. The factors above make large cities net gainers of resources, including institutional and human resources (Kim and Rowe 2012; Fielding 1989). Concerning the rate of urbanisation; while it took all of history until 1960 for the global urban population to reach one billion, it only took another twenty-six years for the population to double to two billion. In the spatial context, the past decades have seen a shift in the geography of urbanisation from the developed nations to developing nations, where 90% of future urban growth is expected to occur (United Nations 2014). By pulling these various strands together, it can be recognised that urbanisation has an indelible mark on major world systems. Nevertheless, there is a paucity of vital information on urban areas and processes of urbanisation (Smit and Parnell 2012; Seto et al. 2013). Smit and Parnell (2012) in their research on urban sustainability and human health from an African perspective highlight the limited data on African cities, compared to other regions, where the impacts of rapid urban growth might be less severe. Thus, although past research on urbanisation is relevant, the shift in the locus of urbanisation to less-developed countries, especially in Africa, necessitates additional studies.

As a dynamic and multi-dimensional process, urbanisation is influenced by complex changes in the environmental, socio-cultural, economic, political, and physical systems of a geographic region, usually transcending through different spatial scales (Ernstson et al. 2010; Swyngedouw and Heynen 2003). According to the World Bank (2009), it is nearly impossible for any country to develop without the growth of its cities and urban areas. This is because urban areas are estimated to account for about 80% of global GDP (McKinsey Global Institute 2012). However, urbanisation has been branded a socio-economic threat, especially for developing nations, based on arguments that sustainable development does not go hand in hand with urbanisation (Misilu et al. 2010; UNDESA / PD 2012; Cobbinah et al. 2015a). For SSA, Bryceson et al. (2009) note that ongoing urbanisation has provided a significant impetus to growth and development. For example, a country such as Ghana has

seen some form of transformational growth driven by urbanisation (World Bank 2015). However, such a situation is not widespread across the region. Consequently, although most discussions about ongoing urbanisation have been about how to mitigate the negative impacts of urbanisation, others have shifted focus on how urbanisation can propel urban socio-economic growth when the effects and benefits of agglomeration, such as financial and human capital availability, are maximised (Page 2012; Miller 2014; Locke and Henley 2016). In most cases, however, agglomeration due to urbanisation may not necessarily result in significant economic growth as the benefits may be eroded by other negative externalities, such as conflicts, environmental degradation, and higher living costs (Locke and Henley 2016).

2.2.4 Urbanisation and globalisation.

Perceived as a logical result of capitalism, globalisation has resulted in increased inter-exchange of goods, services, and capital amongst countries, and is especially facilitated by technological advancements (van Meerhaeghe 2012). A consensus amongst scholars is that urban areas are not stand-alone units but exist as part of an international development milieu (Macotullio 2001) and serve as nodes of globalisation infrastructure (Zhang 2016). Zhang (2016) has cited the example of Mumbai as part of a global real estate development network that attracts investors from distant cities such as London and Bogota. Furthermore, Friedmann (2005) has argued that the world is flat. In this sense, the survival of urban areas, in particular, rapidly growing ones, is impacted by forces that exist well beyond their borders. Therefore, as argued by Held (1992, p.192-202), cities have fewer options than to *"assimilate and integrate with the developing new world order for their survival"*.

An impact of globalisation is the permeation of neo-liberal ethos in the policy frameworks of countries, especially in developing countries (Todaro and Smith 2006; Jones 2010). According to Obeng-Odoom (2012, p. 89), "*the political precept of neo-liberalism is that, while all essential collective decisions need to include the constitutional State, State intervention in the social and economic life should generally be minimal. Rather, the role of the State should be primarily to guarantee and ensure freedom of individual economic agents"*. Therefore, neo-liberalism tends to create and widen markets in all aspects of human life (Jessop 2002). According to Lee and Zhu (2006), the impact of neo-liberalism on the urbanisation process cuts across physical structures and social relationships. Critically, as

Brenner and Theodore (2002, p.15-16) have argued, the uptake of neo-liberal policies *"tends to subject the majority of the population to the power of market forces while preserving the protection for the strongest"*. They further suggest that neo-liberal urban projects tend to 'creatively destroy' existing institutional arrangements by initiating market-oriented reforms and creating new infrastructure for market-oriented economic growth. Thus, the neo-liberal posture assumed by the ideological actors of the globalisation concept, like the Bretton Woods institutions and their progenies, has insidious influences on urban economies. In the context of urbanisation, this is explained through the notion of urban entrepreneurialism. Advanced by Harvey (1989), urban entrepreneurialism refers to the neo-liberalisation of urban governance in a way that results in the shift from urban governance forms that focus on the provision of services to an entrepreneurial form through which pro-growth strategies are pursued in partnership with private actors (OECD 2007; Lauermann 2017). According to OECD (2007), entrepreneurialism is an exploitation of market mechanisms in order to achieve public goals with minimal public intervention. The emergence of this form of urban governance, as stimulated by globalisation, is a double-edged sword as it may lead to the growth and regeneration of urban areas (Wang and Tomaney 2019), but at the same time create pernicious effects that deepen existing divisions in urban areas (OECD 2007). Here, the ability of governments to provide effective governance in an era of reduced public control due to the marketisation influence of globalisation, and its corollary urban entrepreneurialism, becomes questionable (Wu 2001). The pernicious implications of globalisation-induced urban entrepreneurialism can be explained in the context of urban social exclusion where social differentiations perceived in the form of wide-ranging inequalities in wealth, freedoms, etc., hinder the development of urban areas (Young et al. 2006). In this case, some scholars, for example, Mishra (1999), have noted that the neo-liberal realignment in urban areas promoted by globalisation has never guaranteed social integration, cohesion or the survival of the social groups which its market mechanisms tend to marginalise. Of practical relevance, the impact of the neo-liberal instruments is demonstrated with the concept of 'land'. The flow of foreign direct investments (FDIs) as a result of globalisation tends to result in 'control grabbing' which has been defined by the Transnational Institute (TNI) as the *"capturing of power to control land and other resources like water, minerals or forests, in order to control the benefits of its use"* (The Transnational Institute, as cited in Leon 2015, p.262). Subsequently, under neo-liberal conditions, urban land is subject to speculative private acquisition, and landowners and controllers will seek to extract the maximum benefits from land such that the production of public goods, sometimes,

becomes a subordinate issue (Leon 2015). In other words, as Le Gales (2016, p.164) points out, *"land would be completely privatised, with public spaces at the mercy of private individuals. Collective conceptions of public goods would be eradicated"*. The implication of the scenario outlined above is that the rights and interests of ordinary urban citizens are potentially eroded and subject to the discretions of private sector actors and the government (Lee and Zhu 2006). Essentially, as Pacione (2007, p.248) argues, *"the goal of sustainability is not an integral component of market capitalism and will inevitably encounter opposition from entrenched interests"*.

A potentially important manifestation of globalisation is the emergence of a hierarchy of cities that serve as nodes of the global economy. Accordingly, some studies have focused on these 'world cities' and their roles in the world economy (for example, Knox and Taylor 1995; Short and Kim 1999; Sassen 2000; Short et al. 2000). Other scholars have also noted a Western elitist bias to the globalisation literature (for example Grant and Nijman 2002; van der Merwe 2004). Grant and Nijman (2002) have studied globalisation in the context of the changing geographies of developing countries. Citing the examples of Accra and Mumbai, they show that the integration of developing world cities into the global political economy is spatially fragmented. Within the urban and international economics literature, scholars have noted a lack of empirical examinations on the effects of globalisation on the urbanisation process (Gozgor and Kablamaci 2015). For example, research conducted by Nitsch (2006) found no indication of decreased urbanisation after the liberalisation of trade. Others (for example, Ades and Glaser 1995; Davis and Henderson 2003) have also attributed the urbanisation process to political factors including democratisation, rather than economic globalisation.

For SSA, the concept of globalisation has been viewed from a historical perspective as one that confirms its urbanisation experience (Njoh 2005). According to the literature (for example, Winters 1983; Hull 1976; Davidson 1970), towns in SSA had made above standard technological, social, and commercial progress which pre-dated the intrusion of European and Arabian powers. At that time, as Coquery-Vidrovitch (1991, p.21) argues, there was no need to exaggerate or minimise the urbanisation process in Africa because *"its relatively restricted development fitted well within the demographic conditions and modes of production and long distance economic relations of mostly rural and trading societies"*. Subsequently, the trans-Atlantic slave trade, together with colonialism and neo-colonialism,

eroded the influence of African cities on global trade (Njoh 2005). Njoh (2005) asserts that the contemporary process of globalisation had left African cities on the margins. The inability of African cities to actively participate in and benefit from the globalisation process could be attributed to inadequate public infrastructure and services, including water and energy shortages, inadequate transport, and communication infrastructure (Halfani 1996; Mattingly 1999). These inadequacies discouraged industrialisation in African cities as it pushed up the cost of business rapidly, thereby affecting their ability to compete internationally (Njoh 2005). Nevertheless, with increasing globalisation, not only is rapid urbanisation a massive opportunity to provide value to national development in SSA by realising prospects for socio-economic growth and environmental sustainability, it presents itself as an urgent challenge to devise innovative ways of solving the problems associated with the phenomenon (Van Vliet 2002). It is essential to decipher what globalisation means for cities of the developing world and how they can be actively involved in the process. As both urbanisation and globalisation affect economic growth and national development, and are affected by identical challenges (for example, inadequate public infrastructure), their possible interaction must be carefully considered in any related empirical examination.

2.2.5 Urban policy and development.

Achieving the United Nations' Sustainable Development Goals (SDGs) towards making urban areas and human settlements inclusive, resilient and sustainable, will, to a large extent, depend on how these places are managed. Given the current and projected future urbanisation in Africa, there is a renewed focus on the critical and complex issues facing governments and planners in capturing the benefits while managing the risks of such urban transition. The UN-Habitat (2016a) prescribes National Urban Policies to guide the development of cities on the premise that they will result in: (i) the identification of urban development priorities; (ii) the provision of guidance on the future of development; (iii) the better coordination and guidance of actions; and (iv) increased and more coordinated investments. On a more practical note, and in the context of sustainability, urban policies have increasingly been used as instruments through which cities have tried to revitalise and reorganise their systems in ways consistent with sustainability principles (Portney and Berry 2010). The literature is replete with evidence on research carried out on urban sustainability policies. For example, Portney and Cutler (2010) in an explorative study on the pursuit of sustainability in American cities examined thirteen cities based solely on their urban policies and concluded that only seven of

the cities were on a path to sustainability. Others (for example, Portney 2003; Lubell et al. 2009) have also studied the level of sustainability commitment and activity in urban policies across cities in the United States. The general inference made from these studies is that the extent to which sustainability principles are incorporated in the urban policies of American cities, more often than not, depends on the respective local socio-economic and demographic contexts. However, the consensus within the sustainability literature is that achieving sustainability through policy requires the integration and coupling of social, economic, and environmental dimensions in policy initiatives in a way that considers inter-generational and intra-generational equity (Pelletier 2010; Vojnovic 2014).

Subsequently, in addition to their scarcity (Turok 2015), the formulation and implementation of urban policies in Africa over the past few decades have been described as haphazard (Pillay 2008). This raises serious concerns about the capacity of urban stakeholders to design and deliver essential elements of well-functioning urban areas for a continent that is only halfway through a problematic and risk-replete urban transition (Parnell et al. 2009; Bogaert 2011; Buckley and Kallergis 2014; Cheru 2014; UN-Habitat 2014). Several reasons are usually adduced for the lack of urban-centric policies in African nations. These include weak institutions, inadequate financial resources, out-dated regulations, and development agency bias (Bryceson et al. 2009; Turok and Parnell 2009; Bekker and Therborn 2012; Fox 2014).

In the context of sustainability operationalisation in urban policies, while the formulation of urban policies is evidence that cities are taking sustainability seriously, studies also show that there are challenges to the operationalisation of sustainability principles in these policies. From a planning perspective, Albrechts (2010, p.1115) has noted that a key challenge to the sustainability operationalisation in urban policies *"is to develop an approach to planning that will make these ideas and concepts "travel" and that will translate them into an array of practice arena, which in turn will transform these arenas themselves, rather than merely being absorbed within them"*. In this regard, based on his evaluation of climate action in urban policies of over 35 small and large cities, Wheeler (2008, p.488) concluded that the majority of plans *"lack the strong actions and political and institutional commitment needed to mitigate emissions*". The inference made from the author's finding is that, in the absence of commitment to translate the sustainability features of plans into concrete actions, the sustainability intentions of these policies are nothing but rhetoric. Furthermore, Davidson and Arman (2014) have evaluated the sustainability construct in urban policy and metropolitan

strategies in Australia. They concluded that the dominance of urban politics and neo-liberal urbanism hinders the potential of urban policies to stimulate transformative change in the context of sustainability, as in most cases, the priorities of political actors shape the potential of these policies to deliver transformative sustainability change. From a general perspective, Peters (2018) has highlighted the advantages and challenges of coordination for the realisation of policy objectives. Peters (2018) shows that the benefits of policy coordination include: dealing with cross-cutting problems; capturing changing demands; reducing duplication and contradictions among departments; and mitigating 'displacement' tendencies where an actor takes solo decisions without consultation that creates problems for another actor. Furthermore, Peters (2018) highlights reasons for failure in policy coordination to include: power play in government that leads to inadequate information sharing; and, in the context of performance objectives, where actors focus on their targets at the expense of collective goals. This means that the potential of urban policies to deliver sustainable outcomes is also a function of the level of coordination among actors (McGuirk 2012). The above, among other sources of evidence, cast doubts about whether the formulation of urban policies alone is enough evidence to show that cities are taking sustainability seriously (Portney 2003) and warrants an exploration of their sustainability constructs and operationalisation.

From the point of view of sustainable urbanisation, policy initiatives that will direct urban development on a local level are possible solutions for managing future challenges in the transition towards urban sustainability. Especially for the cities of Sub-Saharan Africa where urbanisation is rapidly taking place and weak urban management is pervasive (Smit and Parnell 2012), it has been suggested that NUPs are critical to harnessing the gains of urban growth and expansion (UN-Habitat 2012). A response to the international demand for delivering better outcomes in urban areas has led to the proliferation of national urban policies on the African continent (for example, Ghana's National Urban Policy in 2012). However, the scarcity of national urban policies, or where they exist, the haphazard implementation of NUPs, mean that there is little understanding about how they provide improved information and decision-support tools to adequately deal with the urban sustainability challenges of a rapidly urbanising region. This will require an examination of existing NUPs in order to determine whether their enthusiasm for an invigorated urban development agenda offers hope for transformative change in the context of sustainability

and adequately addresses the forces of ecological transition that are unleashed by the rapid rates of urbanisation in SSA as much as it does for socio-economic forces.

2.3 Sustainable development and sustainable urban transformation

2.3.1 Sustainable development and sustainability.

Sustainable Development (SD) has emerged as a leading paradigm of development (Stock et al. 2017) as popularised by the Brundtland Commission's publication of *Our Common Future* (WCED 1987). In this landmark publication, the Commission defined SD as *"development that meets the needs of the present generation, without compromising the ability of future generations to meet their own needs"* (WCED 1987, p.8). In the years leading up to *Our Common Future*, the United Nations Conference on Human Environment in 1972 brought together world leaders and scientists to discuss ways to conserve and enhance the environment for humans. Post-Brundtland, the 1992 Earth Summit in Rio de Janeiro led to several agreements including AGENDA 21, which sought to help countries on ways to integrate SD in their national strategies. Following that was the World Summit on Sustainable Development in Johannesburg, 2002, which expanded on the first Earth Summit and strengthened commitment towards achieving SD; and the UN Conference on Sustainable Development in Rio de Janeiro, 2012, which aimed at ways of achieving a 'green economy'[2] by providing clear and practical measures of implementing SD. In addition to the fora mentioned above, the recently-expired eight Millennium Development Goals were launched at the start of the 21st century with an overall aim of tackling poverty in all of its many dimensions. The most recent global SD effort has seen the launch of the Sustainable Development Goals which replaced and expand on the MDGs with the aim of transforming the world through 17 initiatives by 2030.

Despite the widespread uptake of SD across the globe (Barkemeyer et al. 2014), its definition remains highly contested. This is not surprising given the range of opinions and schools of thoughts on what it means to develop sustainably. The abstract and contested nature of SD and sustainability as concepts mean that alternative terminologies have evolved in creating and describing linkages among economic, environmental, and social aspects of development.

2 Green Economy is one that results in improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities (UNEP 2016).

As a result, many dozens, if not hundreds, of definitions have appeared since the Brundtland Commission first defined SD (Kates et al. 2005). Scholars have offered further definitions of SD, and by the mid-1990s, over 70 definitions had been identified (Kirkby et al. 1995). Used alongside, and sometimes in place of SD, is the term 'sustainability' which has emerged to describe futuristic thinking where there is a focus on balancing economic, social, and environmental concerns when making decisions concerning the well-being of society (Jeronen 2013). Governments tend to use the term 'sustainable development' as it encapsulates developmental goals of ameliorating living standards, while scholars and international Non-Governmental Organisations (NGOs) tend to use 'sustainability' as it sets the context of living within the limits of the earth. Nevertheless, a common and overarching view held by people and scholars in different fields, governments, and international agencies is the notion of inter-generational equity, which has persisted until today. Even at the level of implementation, differences exist in how developed and less-developed countries perceive the concept. For instance, developed countries tend to stress the 'sustainable' aspect of SD while less-developed countries tend to stress the 'development' aspect (Zhang et al. 2018). Such discrepancies affect the uptake of SD. For example, in less-developed countries where basic needs are increasingly unmet (WCED 1987), meeting such needs, even at a pernicious cost to the environment, might appear justified (Redclift 2005). The scenario above is succinctly expressed by the Brundtland Commission (WCED 1987, p.72) as they stated that *"those who are poor and hungry will often destroy their immediate environment in order to survive: they will cut down forests; their livestock will overgraze grasslands; they will overuse marginal land; and in growing numbers they will crowd into congested cities. The cumulative effect of these changes is so far-reaching as to make poverty itself a major global scourge"*. Thus, as a prominent economist and sustainability scholar, Daly (1991, p. 248) once argued, a "*lack of a precise definition of the term 'sustainable development' is not all bad. It has allowed a considerable consensus to evolve in support of the idea that it is both morally and economically wrong to treat the world as a business in liquidation"*. Furthermore, the openness and malleability of SD's definition mean that it is adapted to deal with diverse challenges across space and time (Kates 2005). The intricacies of SD as a concept, and its persistence on national and international agendas are, thus, summed up by Lafferty (2004, p.26) who suggests that SD *"is now like 'democracy': it is universally desired, diversely understood, extremely difficult to achieve, and won't go away"*. Therefore, drawing predominantly, but not exclusively, on the Brundtland Commission's definition of sustainable development, this thesis will try to present SD as a concept that aims at balancing

economic growth, human well-being, and ecological protection, and is underpinned by a desire to provide equal opportunities among and between generations. In addition, the conflation of sustainable development and sustainability as concepts means that they will be used interchangeably in advancing arguments in this thesis.

2.3.2 Urban sustainable development / urban sustainability.

Kofi Annan, a former General Secretary of the United Nations, once said: *"the future of humanity lies in cities….Weak cities will almost certainly act as a brake on national development. Strong cities can be a key factor enabling a country to thrive in the global economy"* (United Nations 2005, para. 8). As urban areas continue to grow at a higher rate than any other land-use type (Antrop 2000; Hansen et al. 2005), the proportion of the global human population living in urban areas is expected to rise to 70% by 2050 (United Nations 2008), representing over 6 billion of the projected 9 billion people. From a resource-use perspective, over 75% of the planet's resources are consumed by the global urban populace despite occupying about 2% of its terrestrial surface (Girardet 2000). The role of urban areas in achieving sustainable development is reflected in the notion that they serve as battlegrounds on which the battle for sustainability will be won or lost (Clark 2003; Gosling 2006).

Although the United Nations and other world bodies have sought to drive global urban sustainable development through various international fora and guidelines such as the SDGs, the contested nature of SD makes it too simplistic to assume that urban areas in developing and developed countries will undergo similar processes of transformation. On a local to a global scale, pursuing a balanced developmental agenda between and among cities reflects the more extensive sustainable development challenges because urban areas form part of broader physiographic and politico-administrative regions which may extend beyond national boundaries (Simon 2010). Taken together, the underpinning motive of achieving inter-generational equity in the quality of life and ecological footprints could be realised if urban development is carried out in a way such that there is a balanced mix of social, economic, and environmental needs. However, what is meant by urban sustainability? Like other derivatives of SD, there is no standard definition of urban sustainability. However, in its simplest terms, urban sustainability has been defined as *"the process of developing a built environment that meets people's needs whilst avoiding unacceptable social or environmental impacts"*

(Hamilton et al. 2002, p.1). From an ecological perspective, Wu (2014, p. 213) has defined urban sustainability as an *"adaptive process of facilitating and maintaining a virtual cycle between ecosystem services and human well-being through concerted ecological, economic, and social actions in response to changes within and beyond the urban landscape"*.

As shown earlier in this thesis, despite the varied views and definitions of SD, it has had a profound political impact and attracted notable international interest. Thus, in practical response, many programmes, standards, and legislation have been introduced at different spatial levels by governments and international agencies, giving material substance to SD. However, despite the multitude of global and local-level initiatives aimed at making urban areas sustainable, the complexity of urban challenges means that conceptualising progress in the transition towards sustainable cities is problematic. Williams (2010) has observed that there is a conflicting picture of what sustainable cities are supposed to be, and what has happened in reality. The author points out that the popularisation of sustainable development, the infusion of sustainability into urban policies and exemplary initiatives seen around the world in the last three decades, evidences a favourable shift towards making urban areas sustainable. However, the author argues that although the sustainable city concept might have great appeal, it is complex and intangible, so the reality on the ground might be different to and contradict the generally favourable picture painted. For example, the author notes the proliferation of massive construction projects in the global North in ways that disregard any notions of sustainability but are nevertheless heralded by the public and officials. A different scenario presents itself in the global South as increased urbanisation and population growth result in more serious urban challenges in the face of scarcer resources. As Bulkeley and Betsill (2005, p. 42) put it, "*despite ... near universal recognition that sustainable cities ... are a desirable policy goal, there is less certainty about what this might mean in practice*". Furthermore, Childers et al. (2014) have also argued that there is no ultimate state to characterise a sustainable city *per se*, as they view sustainability as a process and not an endpoint. Rather, they argue that the goal of urban sustainability is multi-faceted with continuously changing targets. Thus, cities may pursue this goal by following more (or less) sustainable trajectories.

2.3.3 Approaches to urban sustainability.

As the world has become more 'urban', the inter-linkages among sustainability, human well-being, and the function of urban areas have gained scholarly and political attention (Holden et al. 2008; Sassen 2011). Subsequently, the fuzziness of sustainability as a concept tends to make its constitution and development rather an open question (Jabareen 2008). As a result, urban sustainability has been viewed from the utopian lens of a 'sustainable city' (SC) and in its widest interpretation; it does not only focus on environmental, economic, and social dimensions, but emphasises the involvement and participation of urban citizens in the pursuit of sustainability (Bugliarello 2006; Munier 2007). The 'sustainable city' concept is also viewed as an automatic derivative of the sustainable development in the context of urban development (de Jong et al. 2015). In essence, the SC concept elaborates on the tenets of sustainability discourse and practice, placing it firmly within the context of urbanisation and development.

Accordingly, several new city categories have emerged in urban policy discourse and practice aimed at capturing and conceptualising key aspects of urban sustainability. Although not exhaustive, de Jong et al. (2015) have identified these new city categories to include sustainable cities, green cities, liveable cities, digital cities, intelligent cities, eco-cities, resilient cities, smart cities, and low carbon cities, etc. According to Caprotti (2018), the greater majority of visions for new and future cities are dominated by conceptualisations of highly technical urban futures, cities as economic spaces and cities as efficient spaces. In the particular context of urban efficiency, Caprotti (2018) suggests that while conceptualisations of efficiency in cities may lead to efficient public services in future cities (for example, transport), such conceptualisations may lead to citizens who are able to promote efficiency in urban life being characterised as 'worthwhile citizens', while citizens who are not in a position to promote efficient acceleration of urban life may be discriminated against and potentially controlled. Furthermore, Jabareen (2006) has outlined the characteristics of a sustainable urban form to include factors such as density, compactness, mixed land-use, diversity, greening, passive solar design and sustainable transport. Consequently, Bosehans and Walker (2020) have provided a summary of the definitions and assumed benefits of Jabareen's (2006) sustainable urban form factors (shown in Table 2.1). In the context of sustainable city implementation in SSA, van Noorloos and Kloosterboer (2018) have conducted research on the contested future of urbanisation in Africa. A key output of their research was producing an inventory of current and planned new cities in Africa (Table 2.2), as evidence of the mainstreaming of sustainable city concepts in SSA. From Table 2.2, it is

seen that the mainly ‘new city projects’ in Africa have been branded by their proponents as ‘smart’, ‘eco’, and ‘satellite’ cities. They exist in a variety of forms including newly-built cities, retrofitted urban spaces, as well as extensions or in-fills of existing cities (see Joss 2011a).

While the city categories identified by scholars (for example, de Jong et al. 2015; van Noorloos and Kloosterboer 2018) may vary in their conceptualisation of urban sustainability, they promote normative visions of a ‘sustainable city’ / urban sustainability, and they are fundamentally guided in principle by the synergies among ecological, economic, and social sustainability in order to “*foster economic growth and development through urban activities that reduce negative environmental externalities, the impact on natural resources and the pressure on ecosystem services”* (Hammer et al. 2011, p.34). A few of them will be considered in the following paragraphs as relevant to the research objectives. The review of these selected approaches will enable generalisations of the broader range of approaches of interest to urban sustainability.

Table 2.1: Definitions and assumed benefits of the factors that contribute to a sustainable urban form.

Factor	Definition and Benefits
City compactness	*Definition*: Measurable geographical space that a city consumes: the less space consumed, the more compact the city (Zhao et al. 2014).
	Benefits: Enables high-density residential, industry and transportation developments (Ye et al. 2015), may reduce travel distances (Hamiduddin 2018).
Density	*Definition*: Ratio of people or dwelling units to land (high-density development is often achieved by vertical expansion through mid- and high-rise building projects; e.g., Koziatek et al. 2016).
	Benefits: While low-density development may be related to increased GHG emissions (Baur et al. 2013), high-density development allows more people to live and interact in a narrowly defined space.
Mixed land use	*Definition*: Horizontal mixed land use – that is, an agglomeration of multiple land uses including residential, commercial, industrial, communal, institutional and recreational on a district level – is a key criterion for compact city development (Abdullahi et al. 2018).
	Benefits: Lower (central-) agglomerative forces may lead to a greater dispersion of employment, shorter commute distances and reduce congestion (Wheaton 2004).
Diversity (social mixing)	*Definition:* Different housing types and densities, varying household sizes and incomes, as well as a broad representation of different age groups and cultures (Jabareen 2006).
	Benefits: Lowers travel demand due to access to the same local resources, shapes the social and cultural context of the city and may prevent the segregation of population segments (Fincher and Iveson 2008; Fincher et al. 2014; Holloway et al. 2012).
Greening	*Definition*: Presence of natural green space such as urban parks or community gardens for recreation and leisure
	Benefits: Urban green space provides numerous social and public health benefits (Hartig et al. 2014; Wolch et al. 2014), may increase people's sense of safety in inner-city neighbourhoods (Kuo et al. 1998) and improves the

	likelihood of being exposed to biodiversity (Strohbach et al. 2009).
Passive solar design	*Definition*: Construction of *"building and mechanical systems that are used to convert the sun's energy to useful thermal energy for the heating and cooling of buildings"* (Anderson and Michal 1978, p.58). Can be influenced by the density and type of buildings, building design, the use of water and vegetation etc.
	Benefits: Minimises losses of energy (e.g., heat storage), but also maximizes the gains of passive energy (e.g., solar panels), and may create a more appealing and pleasant urban microclimate (Vallati et al. 2015).
Sustainable transport	*Definition*: Enabling movement by sustainable means of transport such as walking, cycling or public transport through pedestrian-friendly neighbourhood design, traffic calming, good street connectivity, high density and a high degree of mixed land use that reduces the physical separation of activities (Ewing and Cervero 2010; Jabareen 2006).
	Benefits: Conserves energy and resources and promotes physical activity in a multitude of ways (e.g., Handy et al. 2002; Heath et al. 2006).

Table 2.2: Inventory of selected 'sustainable city' projects in SSA

Purpose of city	*New capital city*	*Lower and middle-class housing*	*High class housing and comm. dev*	*Mixed-use: technology / innovation / residential*	*Special Economic Zones*
	Examples				
New-build	Egypt: Cairo	**Ethiopia: Addis Ababa**	**Ghana (Accra): Appolonia City;** Nigeria (Abuja): Jigna.	Morocco: King Mohammed VI Green; **SouthAfrica (Johannesburg): Steyn City.**	Mauritius (Port Louis): Jinfei; **Nigeria (Lagos): Lekki.**
Urban expansion (In-fills)			**DRC (Kinshasa): La Cite du Fleuve;** Kenya (Eldoret): Segoit.		
Retrofit		**Ethiopia: Addis Ababa restructuring.**		**Rwanda: Kigali 2020 inner city restructuring;** Mozambique; Beira restructuring.	Mozambique: Palma Development.

Source: Reproduced from van Noorloos and Kloosterboer (2018, p.1231-1232), and adapted from Joss (2011a). Note: bold font = built or some elements operational; regular font = planned / announced.

2.3.3.1 Smart City.

The genesis of the smart city concept can be traced to the era of the Smart Growth Movement in the 1990s (Neirotti et al. 2014). Promoted as a new form of SD, it has attracted significant scholarly attention, yet with an inexplicit description (Hollands 2008; Vanolo 2013). The smart city concept was borne out of the parallel desires of cities to achieve urban sustainability while remaining competitive. The concept has gained traction in urban spheres

as cities look for innovative ways of managing the increasing population numbers and physical expansion. Although used in various contexts and sectors, a definition of the smart city concept which significantly situates it in the urban sustainability discourse is provided by Sta (2017, p.410) as a modern city that *"uses smart information infrastructure (contains perfect data) to ensure the sustainability and the competitiveness of the different urban functions by integrating different dimensions of urban development and investments in order to reduce the environmental impact and to improve the quality of citizens' lives"*. A working paper on smart cities sponsored by the United States Department of Energy suggests that the vision of *"smart cities is the urban centre of the future, made safe, secure, environmentally green and efficient because all structures…. are interfaced with computerised systems"* (Hall et al. 2000, p.1). The idea of a smart city has been fundamentally enhanced by the rapid evolution in computing and information and communications technology (ICT) in the last five decades which is known to have had profound effects on all dimensions of society (Kramers et al. 2014). Therefore, at the core of the smart city concept is the opportunity to leverage technology in order to address the challenges that cities face in a 'smarter' way (Sujata et al. 2016). That is to say, the concept offers an opportunity to innovatively reassess how cities are planned and developed through the amalgamation of ICT and sustainability principles (Höjer and Wangel 2015). The literature shows that although the concept does not holistically describe a city with particular attributes, its different models indicate the characteristics that make up an ideal smart city (see Figure 2.1) with individual components covering aspects such as natural resources, participation, quality of life, competitiveness; transport and ICT; and social and human capital (Giffinger et al. 2007; Batlle-Montserrat et al. 2016).

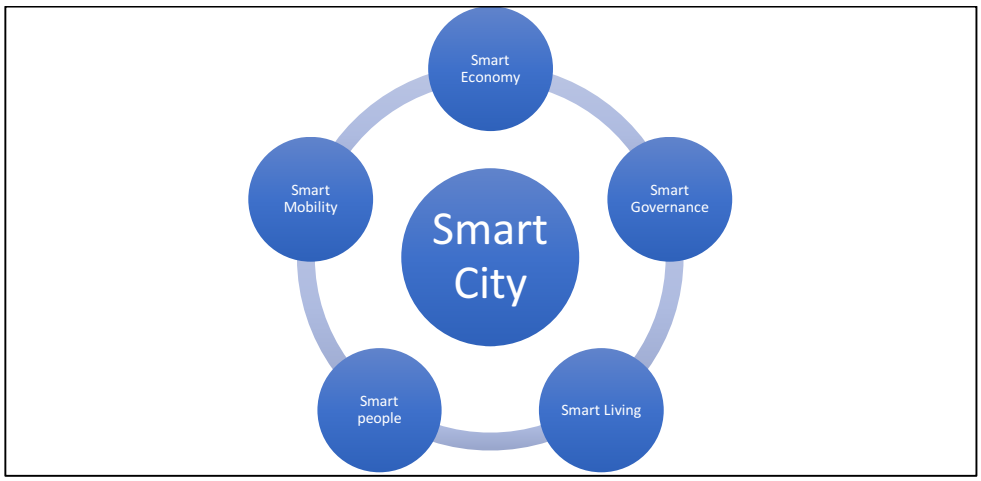

Figure 2.1: Characteristics of a smart city.

Source: Giffinger et al. (2007); Batlle-Montserrat et al. (2016).

In their research into the development of smart cities, Sujata et al. (2016) have also identified the pillars of a smart city initiative to include social, management, economy, legal, technology, and sustainability aspects. The aforementioned pillars, they argue, are crucial if the smart city concept is to be holistically appreciated. From the 'social' perspective, they observe that any smart city initiative should enable the active participation of citizens in its design, governance, and management through channels of communication made available by ICT. For example, in addition to traditional modes of communication, contemporary modes such as social media afford citizens easy access to city data and plans, thereby producing well-educated and informed citizens who can influence the failure or success of a city project. Regarding 'management', the authors maintain that a shift away from traditional governance to e-governance will enhance the efficiency and effectiveness of urban administration as ICT provides the platform to effectively identify and incorporate the needs of different target groups, thereby improving decision-making, policy-making, and public governance. A smart city must be legally compliant and provide innovative ways of tackling regulatory issues. The authors further suggest that a smart city must exploit the rapid evolution of technology in order to facilitate real-time decision-making. On sustainability, the authors highlight the need for a smart city to "*become more competitive for capacity, opportunity and investment by providing an enhanced quality of life, as well as reducing the environmental consequences of urban life by decreasing its carbon footprint"* (Sujata et al. 2016, p.5). The expected benefits of a smart city approach to urban development have been identified by Sta (2017, p.411) to include:

(a) "Making new administrations accessible to residents and suburbanites, for example, constant direction on how best to use various transportation modalities.

(b) Enhancing business ventures through the distribution of continuous information on the operation of city administrations".

Despite the perceived benefits of the smart city concept, some of the literature shows that integrating ICT in different urban settings could potentially undermine the functionality of an urban system. Among the broad range of potential problems are issues of confidentiality, where every move of citizens connected to urban systems are monitored (Smart Cities 2013), the prohibitive costs of installing digital infrastructure (Anthopolous and Fitsilis 2010), and potential forms of exclusion due to inaccessibility to ICT infrastructure (Davis 2010). By

using China as an example, Caprotti and Liu (2019) argue that the mainstreaming of digital technologies in urban systems could potentially redefine citizenship for existing citizens. They suggest that China's social credit systems (SCS) which are designed to reward 'good behaviour' and penalise 'unacceptable behaviour' represent a direct governmental interference in urban living as the behaviour of citizens are judged by what is considered as socially acceptable or not. Overall, Sta (2017) succinctly describes the challenges of the smart city approach as a problem with 'information infrastructure' where prevailing imperfections can have potentially detrimental effects on urban services and decision-making.

2.3.3.2 Eco-Cities.

Eco-cities represent a conceptual model of urban development which is premised on a potential urban future in which there is compatibility between urban growth and ecological processes (Chang and Sheppard 2013). A concept introduced by Richard Register in 1987, he defined an eco-city as *"an urban environmental system in which input (of resources) and output (of waste) are minimised"* (Register 1987, p.6). In the years following his definition, the concept became more widespread, and according to Roseland (1997), instead of assigning a single definition to eco-city, it rather represents a constellation of ideas that cuts across concepts including urban planning, socio-economic development, housing and transportation, all aimed at making cities sustainable.

Joss (2010) has given a historical account of the emergence of eco-cities. He identified three phases of eco-city development, the first of which was the period between the 1980s and 1990s when real examples of eco-cities were rare. The Earth Summit in 1992 and the subsequent adoption of Agenda 21 typified the second phase which led to the development of eco-city exemplars, including Germany's Freiburg District, New Zealand's Waitakere, and Brazil's Curitiba. The third and current phase, which started at the turn of the 21st century, has seen the mainstreaming of the eco-city concept as a global way of addressing sustainability challenges underpinned by rapid rates of urbanisation and increasing focus on climate change. Thus, as of 2011, there were more than 178 eco-city initiatives around the world (Joss et al. 2011). A critical factor that has driven the proliferation of eco-city projects has been the involvement of the private sector with wide-ranging inputs which include: project initiation and planning facilitation; financial, technical, and structural inputs (Joss 2011b).

Focusing on the global South, many countries, especially in Asia, have embraced the development of eco-cities in response to the global call for sustainability. For example, China (seen as a leader in eco-city development in Asia [Wu 2012]) has embarked on large-scale construction of eco-cities in order to address rapid urbanisation and environmental degradation (Caprotti 2014). Accordingly, in China, Caprotti et al. (2015) have assessed the wider sustainability characteristics of the Sino-Singapore Tianjin Eco-city (SSTEC) project. They argue that the SSTEC project is *"discursively constructed as ecologically beneficial for its inhabitants rather than for the broader socio-environmental landscape"* (Caprotti et al. 2015, p.495). This is because while the SSTEC project is dominated by visions, designs, and technologies that could potentially lead to the creation of an *"exclusive 'green', 'safe' and 'comfortable' urban area"*, the extent to which these visions and technologies cater for social sustainability in SSTEC is limited (Caprotti et al. 2015, p.511). The optimal features of an eco-city have been identified by Premalatha et al. (2013, p.2) based on earlier literature (Roseland 1997, 2001; Urban Ecology 1996) which require that eco-cities should:

(a) "have land use priorities such that it creates compact, diverse, green and safe mixed-use communities around public transportation facilities;

(b) have transportation priorities such that it will discourage driving and emphasise access by proximity;

(c) restore damaged urban environments;

(d) create affordable, safe, convenient and economically mixed housing;

(e) nurture social justice and create improved opportunities for the underprivileged.

(f) support local agriculture, urban greening and community gardening;

(g) promote recycling and resource conservation while reducing pollution and hazardous waste;

(h) support ecologically sound economic activities while discouraging hazardous and polluting ones;

(i) promote simple lifestyles and discourage excessive consumption of material goods; and

(j) increase public awareness of the local environment and bioregion through educational and outreach activities".

2.3.3.3 Concluding comments on approaches to urban sustainability.

The discussion on approaches to urban sustainability presented above suggests that dealing simultaneously with the rapid wave of urbanisation and managing existing development will

require a paradigm shift, which, Suzuki et al. (2010) argue, must be fundamentally guided by the systematic adoption of best practices across the globe. Therefore, the discussion above has potentially created a better understanding of the respective approaches and how they contribute to the current debate on urban sustainability. Furthermore, because these approaches to urban sustainability have been developed and implemented mostly in the context of developed economies, their potential application elsewhere requires that attention is paid to the specifics of the context. As a place-dependent notion (Pow and Neo 2013), urban sustainability in a particular city will be challenging to realise based on generalisations. Particularly for this research, as rapid urbanisation is expected to continue in SSA, new strategies for urban sustainability are necessary. At this point, a key question that emerges is how do cities move towards the path of achieving urban sustainability? This directs the focus of the literature review to the concepts of transitions and transformations, as will be discussed in the next sub-section.

2.3.4 Sustainability Transitions.

2.3.4.1 Transitions.

Since the advent of SD, there has been increasing scholarly attention given to ways of realising the transition towards sustainable futures. Thus, the last few decades have seen the conception of transition studies aimed at grasping and influencing transitions (Loorbach and Rotmans 2006). Transitions have been defined by Rotmans and Loorbach (2009, p.85) as *"radical, structural changes of societal (sub) systems"*. The process essentially entails extensive changes that cut across various dimensions of society including: *"technological, material, organisational, institutional, political, economic, and socio-cultural"* (Markard et al. 2012, p. 957); and results in interactions among different actors, institutions, material artefacts, and knowledge (Geels 2004; Markard 2011; Markard et al. 2012). Transitions manifest within societal systems, which are described as parts of *"a society to which a function can be attributed"* (Frantzeskaki and de Haan 2009, p.594).

Rotmans et al. 2000 (as cited in Lachman 2013, p.2) have summarised the characteristics of transitions to include the following:

(a) "they inhibit developments that take place within economic, technological, political, environmental and social spheres that affect each other;

(b) transitions involve various actors from different groups;

(c) transitions are radical shifts (in scope) from one configuration to another;
(d) because of the multiple developments that are intertwined, the multi-actor nature and the existence of radical shifts, transitions have an inherent complexity and uncertainty; and
(e) complexity and uncertainty add to the fact that transitions are long-term processes".

In order to conceptualise transitions, it is important to understand the functional components within and outside a societal system that shape how the system meets the needs of society. Frantzeskaki and de Haan (2009) have identified these functional components to include regimes, niches, niche-regimes, and landscapes. Taking each briefly, a regime has been conceptualised as a dominant functioning of a societal system which directs it along an established pathway of development (Frantzeskaki and de Haan 2009; Markard et al. 2012). An example of a regime is the mobility system in the Western world, which is dominated by fossil-fuel based personal mobility. A niche represents a protected space within which a deviant or novel functional sub-system prevails without pressure from an incumbent regime (Frantzeskaki and de Haan 2009; Markard et al. 2012). Compared to regimes, niches are less powerful and require support (be it political or financial) to progress. Niches, therefore, manifest as sub-systems, which foster the growth of innovations which can replace existing regimes. An example of a niche is low carbon advocacy. A landscape can be described as the environment of a societal system and includes everything that surrounds it (Frantzeskaki and de Haan 2009; Markard et al. 2012). Forces within the landscape can exert pressures which potentially create avenues for niches to grow and replace existing regimes (Markard et al. 2012). A landscape is exemplified by the imposition of a particular political ideology by a government. A niche-regime is a more powerful and competitive alternative functional sub-system which can co-exist with an incumbent regime for a long time (Frantzeskaki and de Haan 2009). An example of a niche-regime can be the emergence of low emission electric vehicles which are expected to co-exist with fossil-fuel based vehicles.

For a transition to occur, there must be an interplay among the previously-mentioned functional subsystems (Raven et al. 2010). From the transition literature, this interplay may take place in phases, namely: a pre-development phase, a take-off phase, an acceleration phase, and a stabilisation phase (Rotmans et al. 2000), as shown in Figure 2.2. First, there is a pre-development phase where no visible change occurs in the state of the system. This is followed by a take-off phase where the status-quo begins to change. An acceleration phase follows where there is a radical and visible accumulation of changes in the socio-cultural,

economic, ecological, and institutional dimensions of the system reacting with one another. Finally, there is a stabilisation phase where the rate of change decreases and a new dynamic equilibrium is reached.

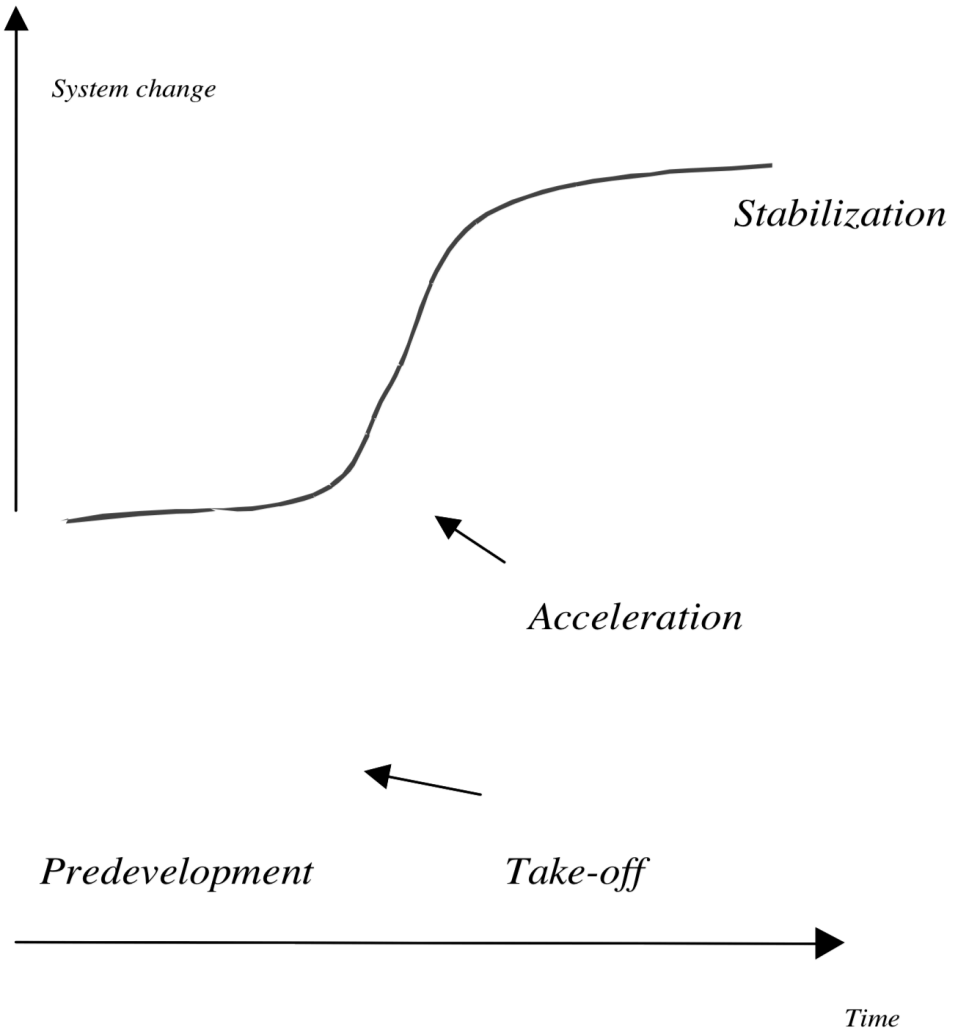

Figure 2.2: Phases of a transition.
Source: Rotmans et al. 2000 (as cited in Rotmans and Kemp, 2003).

2.3.4.2 Sustainability Transitions.

In the context of sustainability, the notion of transition is increasingly used to characterise a *"radical transformation towards a sustainable society as a response to a number of persistent problems confronting contemporary modern societies"* (Grin et al. 2010, p. 1). Thus, from the view of sustainability transition scholars, resolving deeply-rooted problems of existing societal systems, for example, in areas such as energy, climate, water, transport, etc., will require a shift to a new system in which sustainability issues are at the front and centre

(Vob et al. 2009). For example, the inherent threat of climate change on existing socio-technical systems resulting from the unsustainable manner of production and consumption patterns cannot be remedied with 'end of pipe' solutions, but rather necessitates a shift towards more sustainable systems (Raven and Verbong 2009; Lachman 2013). Essentially, the transition to sustainability is expected to interrupt and destabilise contemporary socio-technical structures and nurture substitute systems that emerge to replace the vacuum created by structural change (VoB et al. 2009).

From the foregoing, it can be inferred that the notion of a sustainability transition is a long-term one. According to the literature, a sustainability transition could potentially span decades or generations before being achieved (Kemp and Loorbach 2003; Alkemade et al. 2011). Within the transition literature, scholars have identified some characteristic attributes of sustainability transitions that make their attainment long-term rather than short-term (Elzen et al. 2004; Geels 2007; Stirling 2007). First, the contested nature of sustainability results in diverse views about the preferred pathways to sustainability, the appropriateness of prescribed policies and the efficacy of proposed sustainability solutions (Van Geenhuizen and Ye 2014). This is further compounded by the goal-oriented nature of sustainability transitions, which often results in parallel postures from the private and public-sector perspectives. For example, Van Geenhuizen and Ye (2014) have argued that private actors are less-incentivised to promote sustainability transitions as they tend to behave in a free-riding manner because they see the goal of sustainability as a collective good which is beyond their responsibilities. However, the public sector is expected to support the collective good by stimulating economic condition changes and supporting 'green' niches (Smith and Raven 2012). Second, solutions to sustainability issues do not offer instant benefits to society and are sometimes more expensive to achieve compared to conventional ways of doing things (Van Geenhuizen and Ye 2014). This implies that for a transition to materialise, there must be changes in all facets of a societal system. However, these changes will likely not occur without a competing clash between those with vested interests and those propagating the new way of doing things. A transition towards sustainability is often unpredictable and not achieved quickly because of the complexities and uncertainties associated with the process (York and Venkatamaran 2010; Rotmans and Loorbach 2009; Grin et al. 2010; Van Geenhuizen and Thissen 2002). This may be due to less clear cause-and-effect relations, unintended and adverse effects of policy prescriptions, as well as unexpected changes (Van Geenhuzen and Ye 2014).

The concept of sustainability transitions has resulted in a multitude of conceptualisations which account for the processes of societal system transitions and ways of achieving long-term goals (Markard et al. 2012). Four theoretical framings, which by no means provide exhaustive perspectives, but have gained prominence in transition literature include: transition management (Rotmans et al. 2000); strategic niche management (Mejia et al. 2018); multi-level perspective on socio-technical transitions (Mejia et al. 2018); and technical innovation systems (Bergek et al. 2008). An explication of these four theoretical framings of sustainability transition is provided in the next paragraphs.

(a) Transition Management.

Transition Management (TM) evolved out of the analyses of knowledge on the theory of socio-technical systems (Kemp 1994; Geels 2001), complexity theory (Rotmans 2005), evolutionary economics (Kemp 1994; Mulder et al. 1999) and integrated assessment of long-term changes in society (Rotmans and van Vries 1997). From the literature, remedying the sustainability problems of existing societal systems will need a *"new generation of governance approaches"* with a *"long-term orientation"* as well as policies that are *"flexible, adaptive and reflexive"* and *"deliberation, probing, experimentation and learning"* (Van den Bergh et al. 2011, p.13). Loorbach and Rotmans (2010) view transition management as a form of meta-governance which encompasses stimulating actors and activities to compete against dominant forces and practices by identifying ways of influencing and coordinating the interactions between actors and activities. Critically, the TM approach tries to create a new vision for SD, particularly through miniature projects where various actors (stakeholders) interact to find solutions that address pertinent sustainability problems (Loorbach and Rotmans 2006).

In their paper which examined the practice of transition management, Loorbach and Rotmans (2010, p.245) advocate the need for an *"experimental, innovative, multi-disciplinary and participative form of governance"* like transition management, as they view it as one that is on the same wavelength with the demands of society, research, and policy. They stress the dynamics of 'power and people', which they believe is central to future debates on transition management. Citing the case of the Netherlands, their research showed that the case for transformative change had gained momentum, with the transition in most sectors accelerating towards a structural regime change. However, they argue that the challenge for transition management hinges on engaging regime actors and stimulating societal pressure such that

new societal regimes are co-created from the newly emerging niches and innovative regime actors. Picking up on this, critics of TM argue that it provides few opportunities for inclusive participation within transition arenas (Avelino 2009). In a study of transition management in the context of a transport project, Avelino (2009) highlights the lack of involvement of weak stakeholders. The author argues that 'arenas of transition' are dominated by incumbents which resulted in asymmetric power relations, where the weak stakeholders were hardly heard.

(b) Strategic Niche Management.

The Strategic Niche Management (SNM) approach grew out of the attempt to infuse evolutionary economics with insights from constructive science and technological studies, as exemplified by the work of Nelson and Winter (1982). Schot and Geels (2008) view SNM as a concept whose development was underpinned by the need to find ways of dealing with the challenges of managing sustainable innovations and transitions. Thus, a core idea behind the SNM concept is that niches can be deliberately created and supported in order to induce a shift in regime (Kemp et al. 1998; Hoogma et al. 2002). Through the lens of the SNM approach, the literature (see Kemp et al. 1998; Raven 2012; Smith and Raven 2012; Seyfang and Longhurst 2014) has identified six processes key to niche structuration and development. Mejia et al. (2018, p.220) have summarised these key processes to include: *"1) Visions and expectations are negotiated and articulated by a growing number of actors. 2) A network of different stakeholders takes shape, increasing resources. 3) A shared learning process among actors takes place. 4) There are intermediary organisations and actors who carry localised knowledge to other localities, promoting and strengthening institutional practices among the niche. 5) There is evidence of niche, regime and landscape dynamics. 6) Niche protection not only serves as a shield, but also prompts innovation development and empowers actors"*. They argue that the processes mentioned above will optimally allow a niche to develop and stabilise in a way that increases its probability of causing change at the system level.

(c) Multi-Level Perspective.

A useful framework that explicitly describes sustainability transition is the Multi-Level Perspective (MLP). At the core of the MLP approach is the idea that transitions are products of the interactions existing between processes at various levels, which Schot and Geels (2008) have identified as niches, regimes and landscapes.

(d) Technical Innovations Systems.

The technical innovation systems (TIS) concept conceptualises transitions by focusing on *"actor constellations, networks and institutional structures and primarily seeks to analyse potentially radically new socio-technical configurations that cross-cut established sectoral and spatial delimitations"* (Coenen et al. 2012, p.969). A core assumption of the TIS approach, therefore, is that new technologies can emerge and potentially contribute to future sustainability.

2.3.4.3 Concluding comments on sustainability transitions.

The preceding paragraphs in sub-section 2.3.4 have, thus, elaborated on how transitions evolve and the prominent approaches that have emerged to give more explicit meanings and understanding of the complex and multi-faceted changes that may characterise a potential shift to sustainability. However, as Coenen et al. (2012) argue, the bulk of research on sustainability transitions have focused on sectors of societal systems including health care, water systems, energy, housing, etc., at the expense of a spatial perspective. This means that there is limited knowledge of the locations where the actual transitions take place, *"and the socio-spatial relations and dynamics within which transitions evolve"* (Coenen et al. 2012, p.969). Again, as Foliente et al. (2007) argue, the fragmented response to the vision of making urban areas more sustainable, as manifested through atomised strategies such as 'sustainable energy futures' and 'sustainable water futures', will continue without cross-linkages to mutually reinforcing factors, such as resource use, technological and environmental impacts, socio-economic factors, among others, unless a common goal or destination is found. The fragmented nature of sustainability solutions means that they are spatially limited, one dimensional, and often lack an integrative consideration of economic, social, and environmental factors (Foliente et al. 2007). Nevertheless, as arenas where multiple transitions co-evolve, there is little empirical work that focuses holistically on cities (Hodson and Marvin 2010). Therefore, in the context of this research, a point of departure will be based on the notion that although an urban sustainability transition might not relate to sustainable urban structures and environments (Ernst et al. 2016), all the processes of fundamental change which manifest in a transition and lead to the realisation of 'sustainable places', fall within the descriptions of societal systems advanced by transition scholars (see, for example, De Haan and Rotmans 2011).

2.3.5 Sustainable urban transformation.

The goal of sustainable development that meets the needs of the current generation without compromising the ability of future generations to meet their needs will not be achieved through 'business as usual' policy-making and development paths which often go contrary to the principles of SD. Instead, SD calls for systemic sustainability transformations (Olsson et al. 2014). At the same time, Seto et al. (2010) have argued that ongoing rapid urbanisation has the potential to catalyse the transition towards sustainability due to the effects of urban agglomeration, innovation, and increasing urban wealth, which, Nevens et al. (2013) agree, will only be achieved with better governance structures in place. Put simply, the transition to urban sustainability requires structural transformations in order to realise the interlocking aims of sustainable urbanisation, human well-being, and sustainability. In the context of urban areas, McCormick et al. (2013, p.1) have defined sustainable urban transformations (SUT) as *"structural transformation processes (multi-dimensional and radical change) that can effectively direct urban development towards ambitious sustainability goals"*.

Notwithstanding the previously-acknowledged universal desire to transform urban areas into sustainable places, questions arise as to how the desired transition to urban sustainability can be achieved. Accordingly, Childers et al. (2014) have reviewed the challenges and opportunities of advancing urban sustainability theory and action, and they argue that setting a sustainable transition in motion requires an in-depth understanding of the transitions which urban systems may experience or have the potential to experience. Based on the review by Childers et al. (2014, p.324) of other scholarly work, they suggest that in order to model and exploit the transition to sustainability, the following processes and conditions must be considered:

(a) "The endogenous and exogenous triggers that have led to stresses and crises in contemporary cities must be documented and the causes behind them elucidated (Lucy and Phillips 2000; Graham and Marvin 2001).

(b) Cases in which contemporary cities are in crisis or are under threat as complex systems must be understood (Graham and Marvin 2001; Nassauer and Raskin 2014).

(c) We should explore the motivations that are deliberately moving contemporary cities to become more sustainable—that is, cities that are undergoing this transition because of desire, not crisis (Steiner 2014).

(d) We must expand our view of cities beyond the Global North model of the sanitary city to include non-sanitary cities that are more likely to occur in developing, or Global South nations, and to include regions that have not yet urbanised or are urbanizing in novel ways.

(e) The interaction of key resources that affect all cities provides a focus for understanding the opportunities and constraints that may characterise cities that are more sustainable (Brunner 2007; Kennedy et al. 2007)".

Especially for Africa, where data availability and access are dire, it is not exactly clear how this transition to sustainability will unfold. From the literature, it can be established that SSA countries are developing and urbanising rapidly (Darkwah and Cobbinah 2014). This suggests that they are already undergoing some form of socio-economic transformation. The central question here is: under the conditions of rapid urbanisation, pervasive poverty, and inequality, to what extent is it possible to induce and coordinate transformations that will result in a transition to urban sustainability? Understanding the continent's transition towards sustainability, therefore, demands an assessment of its current urban sustainable development situation which will help situate it within appropriate pathways that will facilitate a long-term and place-specific structural urban transformation process.

Transitioning from the contemporary SSA city to the sustainable SSA African city of the 21st century will require ongoing development and application of new knowledge in order to understand, support, and guide the dynamic processes of transformation. As O'Riordan (2016, p.1) wrote in an editorial issue, "*any transition to sustainability will be challenging. Not to confront it when the opportunity is rife is a letdown to those most deserving of the effort to safeguard their betterment"*. The ongoing urbanisation and associated transformation in the cities of SSA, thus, make them a demonstrable exemplar within which processes related to sustainable development in urban areas can be observed and examined. A fundamental question that has emerged since the advent of SD has been: how will nations that have adopted sustainability principles determine whether they are making progress towards their goals? Progress must be measured. To this extent, the literature is replete with evidence on how sustainability has been evaluated from various perspectives, using different indicators, and through the development of different models. For example, in a study to delimit the concept of sustainable development, Bolis et al. (2014) employed an axiological perspective to develop a conceptual model that evaluated SD in the context of natural

resource, decision-making, and satisfaction of basic needs. Also, Holden et al. (2014) have evaluated the sustainable development of countries based on four equal measures of ecological sustainability, satisfaction of basic needs, and inter- / intra-generational equity. From the above, it appears there is no universal way of sustainable development. An apparent gap in the literature, therefore, is the lack of an evaluation framework which offers a holistic appreciation of sustainable development by facilitating the integration of its dimensions alongside the endogenous and exogenous factors such as poverty, globalisation, among others, which affect how the concept manifests. The rapid pace of urbanisation and the low level of development in SSA means that its situation is far more extensive and complex than discussed, and imminent action is required if the region's 21st century sustainability challenges are to be addressed to any extent. The next section will, therefore, review the literature on urban sustainability assessment by exploring the concept of sustainability indicators and modelling. This will be done with a view to providing the basis upon which sustainability status can be evaluated and understood, and also to help account for the necessary transformations needed in the transition to urban sustainability.

2.4 Urban sustainability assessment

2.4.1 Sustainability indicators (SI).

International, national, and private organisations can make decisions based on information available to them. Indicators and related data are widely recognised as key sources of such information for decision-making (Nader et al. 2008). Like many other concepts, there is no universally-accepted definition of an indicator; many definitions have been found in the extant literature (Joung et al. 2012; Singh et al. 2012). Joung et al. (2012, p.150) describe an indicator as *"a measure or an aggregation of measures from which conclusions on the phenomenon of interest can be inferred"*. Indicators may be quantitative or qualitative, thus providing measurements in absolute or relative terms (Toth-Szabo and Varhelyi 2012). Indicators have the propensity to make problems more visible to stakeholders (Dahl 2012). This ensures that organisations and the public are sensitised on issues, and in effect, widens the basis of decision-making. The existence of an 'indicator industry' (Herzi and Hasan 2004) is a testament to the level at which indicators have gained importance.

As yardsticks of progress, indicators are believed to be vital in measuring and understanding any path towards sustainability (Lynch and Mosbah 2017). This is because they give

indications as to whether a particular system is functioning well or not. Particularly relevant to the sustainability discourse is the high likelihood of well-chosen indicators to facilitate communication of information to a variety of audiences, as well as to minimise the amount of data required to describe and understand a situation (Keirstead 2007). As part of the global response to the need to develop sustainably, chapter 40 of Agenda 21 gives the impetus and reasons for the development of indicators in order to measure progress towards sustainability. It subsequently urges both national and international organisations to make efforts to identify and develop these indicators (Barrera-Roldan and Saldivar-Valdes 2002). Thus, the OECD (2005, para.1) defines sustainable development indicators as *"statistical measures that give an indication of the sustainability of social, environmental and economic development"*. Some countries have made great strides in implementing effective sustainability indicator systems. For example, the United Kingdom and Switzerland have developed coherent and policy-relevant indicators which are linked to national strategies on sustainability (Dahl 2012). However, Weststrate et al. (2019) assert that some governments sometimes 'adjust' the definitions of indicators in order to enhance performance on the aspect being assessed by an indicator. At the city level, cities including Melbourne, Mexico City, Barcelona, Pune, and Taipei have all adopted indicators to measure and monitor the performance of their respective urban sustainable development plans (Shen et al. 2011).

2.4.1.1 Development of sustainability indicators.

The development of sustainability indicators (SI) in the 1990s was underpinned by the need to *"provide a solid basis for decision-making at all levels and to contribute to a self-regulating sustainability of integrated environment and development systems"* (United Nations 1992, p.346). This 'solid basis', Pires (2011) argues, failed to materialise as the overly technical and expert-driven nature of initial indicators developed (see Mitchell 1996; Bell and Morse 1999; Bossel 1999; Spangenberg 2002) rendered them irrelevant for use in urban management and governance. Therefore, rather than becoming tools for driving urban development, a lack of explicit links to local level policies meant that sustainability indicators became isolated technical databases (Bell and Morse 2001). As some authors argue, the exploitable functions of indicators mean that their development cannot be a purely technical issue but should rather involve a transparent policy process (Scipioni et al. 2009; Ramos 2009). Subsequent years have, however, seen the improvement of indicator development as scholars have argued and advanced the idea of linking SI development and urban policy and governance (Bell and Morse 2001; Herzi 2004; Herzi 2006; Rosenström 2006; Lehtonen,

2012). To this effect, Pupphachai and Zuidema (2017) have argued that designing SIs well means that, not only should they be linked to existing policies, but they should also be part of the process of developing new policies.

The development of indicators requires the consideration of key attributes which are expected to facilitate the compilation and analysis of data, as well as enable easy communication and uptake of indicator information. The desired criteria and characteristics of indicators have been well-elaborated by scholars (for example, Moss and Grunkmeyer, 2007; Joung et al. 2012). Consequently, this study adopts the integrated criteria (Table 2.3) established by the Sustainable Measures Group (2009) and Moss and Grunkmeyer (2007, as cited by Joung et al. 2012).

Table 2.3: Characteristics of indicators.

Characteristic	***Description***
Measurable	A measurable indicator is one that can be simply and easily measured by quantitative or qualitative means within a given time frame for data collection and evaluation.
Relevant	A relevant indicator is one that directly relates to a meaningful and purposeful aspect of sustainability.
Understandable	An understandable indicator is one that is easily interpreted by the community and lay people.
Reliable / Usable	A reliable / usable indicator contains trusted and accurate information from the organisation.
Data accessible	Similar to reliable / usable, an indicator must be based on data and information that can be easily accessed and acquired.
Timely manner	Data and information collection, calculation, and evaluation for an indicator must be done in a timely manner for informed decision-making.
Long-term oriented	Indicators must ensure their future use, development, and adoption as an organisational or product sustainability standard.

Source: Joung et al. (2012).

2.4.1.2 Selection of sustainability indicators.

Sustainability indicator selection is, in itself, a decision-making phenomenon for which various approaches exist. From the literature, methods for SI selection include, but are not limited to, 'top-down and bottom-up approaches', and Driver-Pressure-State-Impact-Response (DPSIR) models. It is worth noting that there is no consensus on the best approach to indicator selection. Magee and Scerri (2012) describe SI selection as a complicated process in which traditional top-down or bottom-up approaches may be adopted. Fundamentally, the top-down approaches rely on the inputs and assessments of experts with minimal public involvement, while the bottom-up approaches are citizen-driven (Lynch and Mosbah 2017).

Epistemologically-rooted in scientific positivism, top-down approaches are structured on traditional and formal hierarchies, while bottom-up approaches are based on a 'participatory philosophy' (Turcu 2013). A succinct description of both approaches ranges from scenarios where indicators are chosen based on what experts see as relevant, to the identification of indicators by the ordinary citizen through a participatory approach (Fraser et al. 2006). Accordingly, both approaches to selection have been critically examined by researchers. For example, Wilsdon et al. (2015) have suggested that metrics used in standardised top-down approaches of indicator selection do not necessarily reduce the need to provide locally appropriate measurement tools. Conversely, the same author argues that bottom-up selection approaches are not well-tailored to support continuity and comparability of indicators. An aspect of indicator selection that has been given critical scholarly attention with respect to both approaches is local community participation, which is expected to influence the quality and relevance of the indicators selected (Pissourios 2013). Inclusive participation is crucial to the sustainability agenda as it enables communities to influence sustainability policies (Barry 1999). However, it is argued that inclusive participation will only be realised when the barriers to community participation have been overcome (DETR 2000; Wolfe et al. 2001). Ensuring an efficient selection of sustainability indicators will, therefore, require an optimal trade-off between both approaches. Scholars have proposed various measures aimed at providing a balance between the respective approaches in the selection of sustainability indicators. Astleithner and Hamedinger (2003) contend that collaboration between experts and scholars will enhance the effectiveness of sustainability indicator selection by neutralising the adverse effects of community participation (Lynch and Mosbah 2017). Other proposals include 'building communities of practice' whereby practitioners and scholars are grouped together during indicator selection (Gonzalez et al. 2011), and selection systems where indicators are co-produced by experts and citizens (Graymore 2014).

In the context of urban sustainability, Shen et al. (2011) assert that the indicator selection process should be based on the careful analysis of indicators which have fundamental significance and carry a maximum likelihood of producing accurate information, rather than just gathering data on all indicators. Others have also emphasised that indicator selection should be guided by the questions which they are expected to answer (Li et al. 2009; Joumard and Gudmundsson 2010). Joumard and Gudmundsson (2010) have, thus, introduced ten criteria for indicator selection which have subsequently been organised into three main categories, as shown in Table 2.4.

Table 2.4: Criteria for indicator selection.

Category	***Specific Criteria***
Representation	Validity, reliability, sensitivity
Operation	Measurability, data availability, ethical concerns
Policy Application	Transparency, interpretability, target relevance, actionability

Source: Joumard and Gudmundsson (2010).

2.4.1.3 Challenges to the use of sustainability indicators.

Despite the benefits of an indicator-based approach to sustainability, it has been argued that achieving an optimal trade-off between the political relevance and scientific accuracy of indicator use remains 'a balancing act' due to certain methodological challenges (Hilden and Rosenstrom 2008; Mieg 2012). Mieg (2012) has outlined these challenges as problems of 'incompleteness', 'aggregation', and 'specificity'. Accordingly, questions that have led to the realisation of these methodological challenges include:

(a) What makes up a complete set of indicators? This question highlights a lack of a universal theory for (urban) sustainability where relevant and accepted indicators are well defined. For example, while ten general indicators were used in the European Common Indicators project to cover all dimensions of SD, the United Nations Commission on Sustainable Development (UNCSD), in a similar project, used nineteen indicators to represent each dimension of sustainability. Thus, as Mieg (2012, p.253) argues, *"if a measurement focuses on relevant indicators it risks being incomplete; if it attempts to cover everything the measurement risks becoming irrelevant*".

(b) How can different indicators be combined into a single valuation? A widespread problem of indicator use in (urban) sustainability study and practice is the aggregation of indicators into a single but standard valuation. In a different scenario, this methodological challenge has been closely linked to the concepts of weak and strong sustainability (Mieg 2012), which are discussed further in Section 2.6.3. Here, weak sustainability will undermine the general applicability of metrics to be used in an indicator system as it allows for a deficiency in one metric to be compensated for by a stronger metric. For example, where a metric representing environmental sustainability is lacking, it may be compensated for by a metric depicting

economic growth. In a similar vein, strong sustainability affects the aggregation of metrics into a single valuation as it fundamentally requires certain metrics to be present without substitution or compensation (Hopwood et al. 2005). In this case, strong sustainability raises questions on 'relevance' as it ensures the inclusion of some metrics as a basic requirement irrespective of whether or not they are relevant to what is being measured.

(c) Should general indicators be preferred to local ones? Specificity is a common problem area in the use of indicators. This leads to a dichotomy of choice between either general indicators or a place-specific local indicator. Mieg (2012) is of the view that while general indicators are highly useful in comparing cities, place-specific indicators may be more appropriate, especially in the context of (urban) sustainability. The author cites a typical example of the use of place-specific indicators as Seattle in the United States, where certain traits in the growth of salmon as they return to freshwater sites (for example, size at age, age at maturity, contaminant loads, among others) are examined for evidence of changing marine conditions (Sustainable Seattle 1998; Irvine and Riddell 2007). Thus, the argument for place-specific indicators is that they promote a strict local approach, but at the same time, they maintain the common criteria for (urban) sustainability management (Pastille Consortium 2002).

Furthermore, when considered within the context of important global commitments such as the New Urban Agenda[3], Caprotti et al. (2017) suggest that the uptake and usefulness of sustainability indicators are potentially undermined in the arena of urban development practice due to factors which include: how sustainable cities are standardised, the role of experts, as well as the appropriateness of measurements and data. For example, Caprotti et al. (2017) argue that aside from the lack of data, the use of indicators to capture urban realities tends to be challenging due to the entanglement of measurements with the lives and priorities of urban citizens. The foregoing should, however, not be construed to imply that these challenges have limited the usefulness of sustainability indicators, rather they suggest that more thinking is needed to make indicators more 'fit for purpose'.

[3] The New Urban Agenda (NUA) is a global commitment to promote urban sustainability that was agreed by national governments at the Habitat III summit held in Quito (Ecuador) in 2016 (Valencia et al. 2019).

Critically, the literature has shown that practical issues such as indicator selection, as well as methodological challenges of indicator use, influence the broader application of these indicators. These practical challenges mean that there is little gain in sustainability performance, as indicators tend to lead to mixed results on application in certain parts of the world (Selman 1999; Alshuwaikhat and Nkwenti 2002; Seabrooke et al. 2004). The challenge, therefore, for international governments, international organisations, and urban managers, especially concerning cities in developing countries, is to facilitate the universal application of sustainability indicators, by identifying best practices and making attempts to aggregate key aspects of the many different systems. This is expected to improve links between sustainability indicators and the policy process, thereby ensuring the effective and conceptual use of indicators.

Furthermore, apart from a few studies that have attempted to measure urban sustainability in the global South (for example, Turok and Borel-Saladin 2014), extant studies on (urban) sustainability generally relate to cities of developed nations (see Tanguay et al. 2010), a situation that is sometimes justified based on the lack of data in developing nations (Cloete 2015). The implication for Africa, as Cloete (2015) argues, is that effective assessment of sustainability is currently unrealistic. Many countries in SSA lack baseline sustainability data, both at the local and national levels. Hence decisions on sustainability tend to be taken based on potentially erroneous or outdated information. Although the development of a complete new set of indicators to measure progress towards sustainability in SSA cities is beyond the scope and focus of this study, it can be inferred from the literature that the potential experience that could be gained by applying carefully-selected indicators on a comparative basis will essentially contribute to the development of standard processes of urban sustainability performance assessment. The next section will, thus, discuss the various models within which indicators could be adopted to assess sustainability.

2.4.2 Modelling sustainability.

Sustainability decision-making is a daunting task that requires the consideration of economic, social, and environmental interactions in a mutually reinforcing manner. In specific sustainability terms, the literature shows that several theoretical models have been developed to explain sustainability as a concept (for example, see Spindler 2011; Bott and Grassl 2013). However, as Van den Bergh and Hofkes (1998) note in their survey of economic modelling

of sustainable development, there is no best approach to modelling sustainability, but rather a multitude of approaches exists which provide varied but complementary insights into sustainability. Also, according to Ali-Toudert and Ji (2017), the background of an observer examining sustainability determines how the concept is perceived and the particular aspects that will be highlighted. Thus, the different approaches to modelling sustainability are attributed to the distinct theoretical starting points, as well as the complexity of its different dimensions (Van Den Bergh and Hofkes 1998). Todorov and Marinova (2011, p.1-2) have identified a general typology of models used in representing and studying sustainability according to five major categories, as shown in Table 2.5.

Table 2.5: Categories of models.

Model Category	Description
Quantitative models	Mathematical, statistical, data-based, econometric and computer simulation.
Pictorial visualisation	Venn diagram, graphical representation.
Conceptual models	Representing particular concepts and theories.
Standardising models	Including indicators, benchmark values and targets.
Physical models	Physical version of object / system that enables further investigation.

Source: Todorov and Marinova (2011).

(a) *Physical models* have generally been used to describe the environmental components of sustainability. While physical models reduce uncertainty, enforce trans-disciplinarity, and are participatory, they have been criticised for having limited time spans and being overly specific (Todorov and Marinova 2011). As an example, Karlsson (2008) modelled the lead losses in Sweden through the use of lead-acid batteries.

(b) *Pictorial visualisation models* use flow charts, Venn diagrams, among others, to emphasise the importance of the inter-linkages among the dimensions of sustainability, and stress the need for an interdisciplinary and trans-disciplinary approach to sustainability. For example, the World Conservation Union (2006) has used overlapping circles of a Venn

diagram to portray the intersection of the pillars of sustainability, as shown in Figure 2.3. The merits of visualisation models include their emphasis on trans-disciplinarity, while a significant drawback is the limited amount of information they provide (Todorov and Marinova 2011).

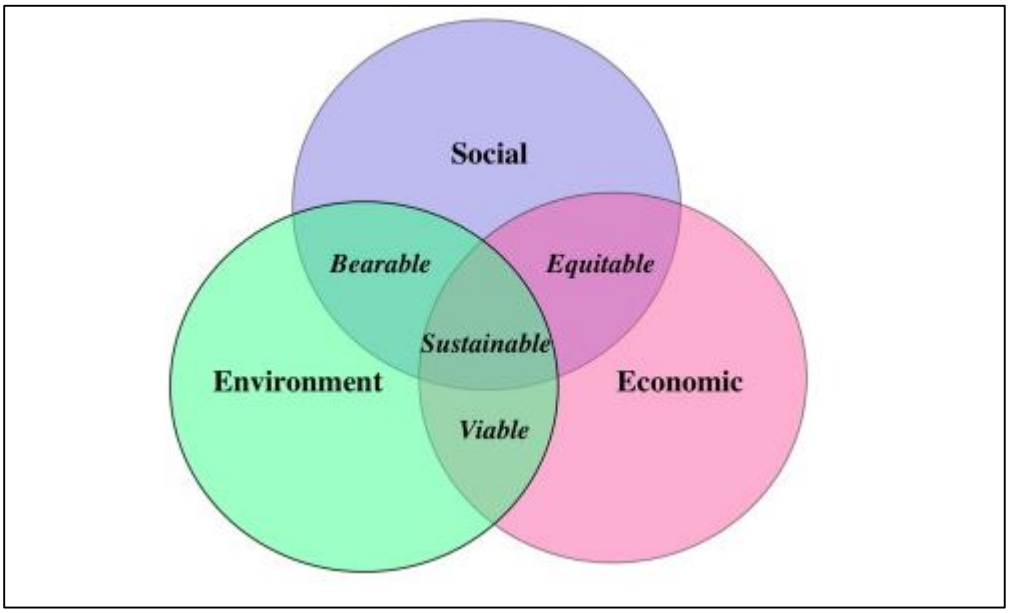

Figure 2.3: Intersection of the pillars of sustainability.

Source: World Conservation Union (2006).

(c) *Conceptual models* are underpinned by particular concepts and theories, and are developed based on long-term and inter-generational considerations. A major weakness is their poor reaction to uncertainty. Nevertheless, they are known for triggering policy responses.

(d) *Standardising models* make use of indicators and other measurement tools in order to give a snapshot of a prevailing situation. They may be participatory and can be used for evaluation at both global and local levels. While most standardising models are designed with a long-term view, the temporal nature of the indicators means that the model cannot be entirely futuristic.

(e) *Quantitative models* employ statistical, econometric, and mathematical approaches to evaluate situations. They are developed from a long-term perspective and are equipped to

deal with uncertainty. However, their development can be less participatory, and they usually do not have a holistic appreciation of situations.

2.4.2.1 Urban sustainability modelling.

Converting the vision of a sustainable urban space into reality requires significant shifts in policy from the local to the global level. From the literature, there has been significant attention given to advanced methods through which urban sustainability is assessed and evaluated (Ali-Tourdert and Ji 2017). Kupiszewska (1997) has identified possible approaches to urban sustainability modelling to include 'cross-sector approach' and 'activity approach'. A cross-sector approach may be: resource-oriented where the flow of a resource is tracked and evaluated for current and future use; or population-oriented where factors affecting an environmental sector are tracked and evaluated. Activity approach involves the selection of a human activity and an assessment of all of its impacts on sustainability. The Organisation for Economic Cooperation and Development (OECD) has also developed the DPSIR system (DPSIR: driving force, pressure, state, impact, response) as a way of modelling urban sustainability based on the organisational process of urban development (Dizdaroglu and Yigitcanlar 2014). The core principle, however, is that due to the various interpretations and the complexity of urban sustainability, as well as the number of approaches available, the choice of approach or model is effectively determined by what the user wants to achieve with the model (Kupiszewska 1997; Ali-Tourdert and Ji 2017). For example, as one of the first attempts to tackle urban sustainability within a comprehensive framework, Spiekermann and Wegener (2003) have modelled urban sustainability in Europe as part of a European Union project called PROPOLIS (Planning and Research of Policies for Land Use and Transport for Increasing Urban Sustainability). In assessing urban strategies for their long-term effect on European cities, they developed a comprehensive evaluation system which consisted of integrated land use, environmental, and transport models together with indicator and presentation systems. Also, Li et al. (2016) have modelled transition to urban sustainability in the industrial city of Jianching in China. They argue that an integrated mixed method of urban metabolism modelling through material flow analyses complemented by a qualitative enquiry helps in understanding the complexity of urban systems.

2.4.2.2 Geospatial applications and urban sustainability.

The sustainability concept offers an opportunity to improve the quality of life through the careful integration of social, economic, and environmental concerns (Grundey 2008). As nature and society typically evolve in space and time, the spatio-temporal distribution of the pillars of sustainability should be taken into account during any decision-making. This is particularly important as spatial relationships are seen as some of the most vital factors that influence the various dimensions of sustainability (Sakalauskas 2010). Furthermore, an overall measure of sustainability cannot be achieved without geographic considerations of the locations where the sustainability parameters are to be measured. In essence, the complexity of sustainability as a concept makes it increasingly necessary to draw from different fields of knowledge. According to Ward et al. (2000), appropriate spatial information represents one of the most essential tools used in the analyses of questions of sustainability. To this end, (Ridd 1995) argues that remotely-sensed data can be a source of verifiable urban composition information.

Accordingly, remote sensing has gained recognition as an effective tool used in the analysis of spatio-temporal landscape change dynamics at different levels (Serra et al. 2008; Geri et al. 2010). The application of remote-sensing techniques in the study of land cover and land use can help improve our fundamental understanding of the dynamics of contemporary urbanisation and the complexities between urban systems and sustainability. Essentially, analysis of the spatio-temporal characteristics of land use / land cover (LULC) change is expected to provide a comprehensive understanding of the ecological consequence of urbanisation (Samal and Gedam 2015), and such analyses are an essential source of information for decision-making (Deng et al. 2009). The literature also highlights the importance of LULC-related data and maps for sustainable development (see Lambin et al. 2001; Turner et al. 2007). This is because some LULC data outputs are directly related to biophysical outputs such as ecosystem services and deforestation. Specifically, in terms of urban sustainability, LULC change outputs have enabled analysis of 'urban sprawl'[4], which can be described as an implication of rapid urbanisation whereby there is uncontrolled expansion of urban areas and which sometimes results in urban areas moving beyond administrative boundaries and into adjoining districts (Zeng et al. 2005; Wang et al. 2020). As a result of urban sprawl, the urban landscape (form) is reshaped and urban areas attain

4 According to Wang et al. (2020, p.1), *"urban sprawl refers to rapid, low-efficient, and disorderly growth of non-agricultural land towards peripheral areas"*.

attributes such as low density[5] and scattered neighbourhoods, segregationist land use, and peri-urbanisation[6] (Aurand 2007; Abudu et al. 2018). The sustainability implications of uncontrolled urban sprawl include, but are not limited to, air pollution, ecological habitat fragmentation, traffic congestion, and resulting air pollution (through increased GHG emissions), increase in urban temperature, socio-spatial segregation[7], and restricted coverage and access to urban services (Polidoro et al. 2012). From a transition perspective, a time series analysis of land cover change is useful because according to Turnheim et al. (2015), practical efforts to examine transitions require the conceptualisation of the trajectory and connections between the past, present, and future. Therefore, remotely-sensed imagery offers the opportunity to analyse and perceive the trajectory towards the long-term vision of sustainability through continuous monitoring and appraisal over a particular period. Similarly, it has been argued that the complexities of transitions make it impossible to design and manage it from the outside (Lachman 2013). Pragmatic efforts to study transitions will, thus, require retrospective steering and stimulations in the context of its dimensions, speed, size, and time (Kemp and Loorbach 2003).

2.5 Sustainable development, urbanisation, and the urban citizen

Rapid urbanisation has consequences for sustainable development. Subsequently, the importance of citizens in the urbanisation and SD discourse cannot be overstated since they are the most important actors whose activities influence both the urbanisation process and the social, economic, and environmental dimensions of sustainable development. Furthermore, in the quest for solutions to the challenges that arise from the interaction between the processes of urbanisation and sustainable development, engaging solely with stakeholders who share the experts' view is akin to 'preaching to the choir', a situation that is inconsistent with the holistic characteristics of SD as a concept. In the urban context, a consensus within the sustainability literature is that community (citizen) support is a strong predictor of the extent

5 Low density areas result in single or small family neighbourhoods which are far from consolidated city centres where the core of urban services exist (Aurand 2007).

6 Peri-urbanisation is the extension of urban areas beyond administrative boundaries into adjoining rural districts such that there is a clash between urban and rural uses of land (Aurand 2007).

7 Socio-spatial segregation, as a result of urban sprawl, leads to a situation where the urban poor are far removed from the urban central district where economic opportunities are concentrated, thereby potentially missing out on jobs and urban services (Polidoro et al. 2012).

to which cities are committed to sustainability (see, for example, Laurian and Crawford 2016; Swann 2017). Thus, in an increasingly urbanised world, an underlying assumption is that the demographic and landscape change will lead to (positive and negative) alterations in urban systems with wider implications for overall sustainability experience. In this context, the literature already reviewed has shown that governments have formulated various policies and programmes to manage urbanisation in a manner that promotes sustainable development. A fundamental expectation is that these policies will shape the urbanisation process in a way that promotes economic prosperity including: adequate income and job creation; social well-being including access to basic services; environmental well-being including pollution reduction, and conservation of ecological resources; and the overall sustainability of urban areas. As development is dynamic, many of the expected outcomes of these development policies and programmes will only be observable in the medium to long-term if appropriately measured. Nevertheless, the question inevitably arises: what are the perceptions of citizens based on their lived-experience in the context of urbanisation and sustainability? Addressing this question requires an understanding of the perceptions of citizens in order to identify factors that shape their sustainable development experience, an exercise that is important for improving and moulding policy towards achieving sustainability.

Perception has been defined as *"the organisation, identification and interpretation of sensory information to represent our environment"* (Xiao et al. 2016, p.258). It is recognised that the perceptions of stakeholders provide useful constructs for the exploration of organisation behaviour (Delmas and Toffel 2004). Accordingly, the exigency to achieve sustainable development across all spheres, including in urban areas, has prompted the proliferation of research in diverse disciplines on perceptions and attitudes of citizens in the context of sustainability. From an urban sustainability perspective, Macke et al. (2018) have studied the subjective quality of life in a smart city by exploring the perception of citizens in a Brazilian case study. They found that the overall perception of the respondents about the main elements characterising Curitiba as a smart city implied their low level of satisfaction. They concluded that exploring the perceptions of citizens helped to deconstruct the interconnected facets of quality of life domains in the context of smart cities. Worth noting here is the fact that the majority of these studies have either focused on perceptions of sustainability in disciplines such as higher education, or when conducted in the context of urban sustainability, they have mainly focused on places outside SSA. Thus, the limited coverage of citizens' perceptions in the context of urban sustainability in SSA is a critical gap in the literature. Filling this gap is

important because the subjective experience of citizens through an exploration of their perceptions is a powerful tool through which they can provide information about the characteristics of their environment (Hsieh 2012). Furthermore, the acceptance and support of citizens are critical if a city is to successfully realise its sustainability ambitions (Laurian and Crawford 2016; Swann 2017).

According to Moganadas et al. (2013), people differ in their views, priorities, and motives with regards to sustainability. While prevailing conditions such as the political economy may shape the wider experience, the perception literature suggests that other factors may be at play. These factors have been highlighted to include demographic factors such as age and gender (Olsson and Gericke (2016), socio-economic status, and education attainment (Aina et al. 2019). For example, Narducci (2019) found significant differences based on age, education, political ideology, and gender in respondents' perceptions of ecosystem services in their study which evaluated the implications of urban growth and farmland loss for ecosystem services in the western United States. Also, Tuncer (2008) found significant differences in the perceptions of female and male respondents in a sustainable development survey of students. The general literature (for example, Voon 2012) also shows that diverse economic and psychological influences shape individual perceptions. The inference made from the above explication of perception literature is that, differences in demographic characteristics and socio-economic conditions among others, potentially shape the perceptions of citizens. In other words, two individuals could face the same wider economic conditions but have different perceptions about the impacts of the economic conditions due to differences in demographic and socio-economic characteristics.

The reverberation of SD as a concept has led to the promotion of practices such as recycling in urban and sustainability-related programmes and policies in order to influence stakeholders to embrace sustainability. However, the consensus within the SD literature is that sustainability cannot be achieved without a corresponding change in attitude across all levels, including at the national level and at the level of citizens (Kalsoom 2019). In this regard, Fairfield et al. (2011) in their study of the influences on the organisational implementation of sustainability argue that how organisations prioritise various sustainability issues will strongly determine the extent to which specific sustainability practices are implemented. This accentuates the need to gauge the interests of stakeholders like employees in the uptake of these sustainability practices (Velazquez et al. 2005). According to Pappas and Pappas (2014,

p.12), *"individual behaviour creates the foundation for action in social, economic and environmental sustainability, and potentially guides human ability to work with one another to make life-affirming decisions"*. They conclude that when the day-to-day behaviour of individuals is aligned to well-stated values, the potential for greater sustainable community action is enhanced. Furthermore, Kalsoom (2019) has deconstructed the concept of 'attitude' from an SD perspective. He describes 'attitude' as a reflection of the degree to which people value sustainability and its several dimensions. He shows that attitude may be evaluated along the lines of the extent to which an individual favours a particular action, and that may be positive, neutral or negative. He further shows that attitude is not directly observable but may be inferred from what an individual says, intends or does. Finally, he expands on the link between attitude and behaviour; and argues that attitude is a proxy measure of people's behaviour, and inserts a caveat that positive attitudes do not always translate to behaviour. Extending the above to the context of this study, SD policies may promote the uptake of pro-sustainability behaviour or practices such as recycling by citizens; a question that emerges however is: how important are these practices to the targeted citizens, and to what extent are citizens willing to commit to in the implementation process? As the successful implementation of sustainability-related initiatives is shaped by the prevailing political economy (Davidson and Arman 2014), and as a result of the diversity that exists in people's views, motives, and priorities (Moganadas et al. 2013), it is critical to understand attitudes to sustainability in the context of the extent to which people are willing to partake in or promote pro-sustainability behaviour or practices. It is also recognised that the perceptions of stakeholders (citizens in this context) reflect their capability and willingness to promote sustainable practices (Gordon et al. 2012; Kerselaers et al. 2013). Therefore, as part of any inquiry on urbanisation and sustainability, it would seem appropriate to explore the nature of citizens' perceptions and their attitudes towards sustainability-related behaviour or actions in a way that also appreciates differences in views among people based on factors including demography and socio-economic conditions.

Critically, from what has been discussed so far, the importance of citizens' perceptions cannot be understated, if understanding the interactions between urbanisation and sustainability at the local urban level, and making recommendations for a transition to urban sustainability (which are central to this thesis), are considered. For example, considering the perceptions of citizens in this thesis would facilitate a social construction of knowledge about the realities that underpin the interactions between urbanisation and sustainable development

at the local urban level. Furthermore, in making recommendations for a transition to urban sustainability, exploring the perceptions of citizens would facilitate the provision of evidence-based guidance for sustainability transition that reflects the priorities, needs, concerns, and experiences of citizens. This is crucial if citizens are to embrace policies and programmes designed for sustainability transition (see Matschoss et al. 2019). Importantly, as is captured in the DPSIR (Driver-Pressure-State-Impact-Response) framework that will be proposed later on in Section 2.6.7.2, citizens and their perceptions thereof, constitute an important 'response' for managing the interactions between urbanisation and sustainable development into more sustainable outcomes.

2.6 Towards a framework for understanding urbanisation and sustainable development

The sub-sections that follow discuss theories and concepts which are relevant to the present discussion and provide a foundation upon which a conceptual research framework, that facilitates an understanding of the interactions between urbanisation and sustainable development in an integrated manner, is proposed.

2.6.1 Theories of urbanisation and development.

Apropos the debate on the causes and effects of urbanisation in developing countries, three theories which present different, but sometimes harmonious explanations of urbanisation, are considered useful for discussion in this thesis.

2.6.1.1 Modernisation and urbanisation.

Modernisation theory emerged in the middle of the 20th century as a model to explain the contrast and transition from an underdeveloped or traditional society to a modern one. Thus, the core concepts of the modernisation theory are 'tradition' and 'modernity' (Fangjun 2009). Theorists of the school of modernisation point out that there is a bi-directional relationship between urbanisation and industrialisation (Berliner 1977), further highlighting a release of surplus labour from agrarian regions to support industries in the urban areas (Dutt 2001). Furthermore, modernisationists consider urban areas as places of modernising institutions, such as educational facilities or factories (Bradshaw 1987). Within this line of thought, the underlying claim is that these modernising institutions serve as pull factors which draw people from rural areas to urban areas. Therefore, the more modernised a place is, the more urbanised it will become.

The modernisation school has been criticised for being a subjective conceptualisation that unalterably divided society into 'traditional and modern'; and also as a mechanism to spread American ideology (Yuan 2009). In the African context, criticisms of the modernisation theory abound. Matunhu (2011) has critically assessed the impact of the modernisation theory on Africa. He argues that ideas of modernisation contributed significantly to poverty on the continent. This is because the theory placed more value on external aid with inhibiting conditions at the expense of creativity and initiative of Africans themselves. Furthermore, he notes that the theory placed more emphasis on the supremacy of metropolitan regions in marshalling Africa's development, which undermined its already established structures of values and beliefs. The result was the discarding of Africa's own development path and the adoption of externally-controlled ones. This scenario can be implicitly used to explain the current trajectories in SSA, where Western interpretations basically underpin issues such as development and urbanisation. As Bull and Boas (2012) note, despite various criticisms, the modernisation theory still exists in contemporary theoretical frameworks, development strategies, and policy discourses. The foregoing, therefore, reinforces questions as to whether contemporary urbanisation in SSA should be pursued within the status quo or deliberate efforts should be made to steer urbanisation in a manner that fully considers prevailing conditions on the continent.

2.6.1.2 Dependency and urbanisation.

Dependency theory emerged in the 1950s as part of the debate on how unfair trade rules between poor and wealthy countries stagnated economic growth in poor countries, as compared to the wealthy industrialised countries (Ferraro 2008). Subsequently, dependency theory emerged as a medium for analysing issues of 'underdevelopment' within the global political economy (Namkoong 1999). From the literature on dependency, scholars have observed a dependent status by the poorest countries of the global South in the international economic and political systems (see, for example, Rodrick 2000; Knack 2001). Haq (1976) has viewed dependency from a historical perspective. He links the inequality in economic exchanges between the global North and South to the colonial era which strategically positioned the North at the centre of the world and the South on the periphery - as suppliers of raw materials. Essentially, colonial systems were designed to stifle any prospects of industrialisation in African cities by transforming them into European dependencies. By using communication as an example, Njoh (2005) describes how no direct telephone calls

were allowed between any two African nations, and how telephone services were exclusive to European residents in African cities. Therefore, a call from Abidjan in Ivory Coast to Accra in neighbouring Ghana had to pass through routers in France and Britain before reaching Accra. The fundamental argument in Haq's (1976) account, as summarised by Agbebi and Virtanen (2017), is that economic exchanges were more likely to be fair between equal partners rather than the unequal partnership promoted by colonialism.

An important dimension to dependency theory is the role of Foreign Direct Investment (FDI), usually through Multi-National Corporations (MNCs). Scholars have noted an increase in the level of international economic exchanges between advanced countries and poorer countries in the form of MNC investments (Bornschier and Chase-Dunn 1985; Ross and Trachte 1990). They argue that the conditions around these investments sometimes erode revenue, which could have been channelled into development programmes by poor countries. An example is when countries offer incentives in the form of tax and wage reductions to MNCs in order to attract more foreign investments (Ross and Trachte 1990; London and Ross 1995). MNCs are sometimes seen as impediments to development in poorer countries by hampering government policies for the people that are not in the interest of the MNCs (Bornschier and Chase-Dunn 1985; Ross and Trachte 1990). Furthermore, from the perspective of dependency theorists, the inflow of FDI is believed to impact negatively on economic growth and income distribution (Adams 2009). For example, according to Bornschier and Chase-Dunn (1985), an economy mainly fuelled by FDI will potentially result in the 'under-utilisation of productive forces' due to a monopolised industrial structure. The effect is a stagnant economy, as the multiplier effect, through which demand in a particular sector creates further demand in another sector, is weakened (Adams 2009). This is especially true for SSA where most FDIs go into the extraction of natural resources (Pigato 2000).

Proponents of the dependency theory try to link it to urbanisation by explaining the inter-linkages with issues including the availability of land and other resources, especially for people in rural areas. Some scholars are of the view that urbanisation (for example, as a result of MNC projects) potentially leads to landlessness in the rural areas and forces the rural population to move into cities in search of better opportunities (Njoh 2003). An example of this situation could be when farmers in a rural area are paid and dispossessed of their farming land in order for a mining project to take place. Without viable alternatives to employment, there is a tendency for these farmers to move to cities in search of better opportunities.

Furthermore, others have argued that rapid urbanisation tends to distort urban-labour markets (Bradshaw and Noonan 1999). Also, dependency theorists have been instrumental in giving the developmental issues of the poorest countries the attention rightly deserved (Agbebi and Vitanen 2017). While not directly linked to the urbanisation process in general, this brief overview of the dependency theory is deemed relevant to the present discussion as it gives a theoretical underpinning on how the present developmental state in the area of interest has evolved.

2.6.1.3 Urban bias and urbanisation.

Coined by Lipton (1977) in his seminal work on urban growth and development in developing countries, 'urban bias' denotes an observation of a heavy systematic bias that skews resource allocation in favour of urban residents. In his classic account of *Why Poor People Stay Poor*, Lipton (1977) argues that the urban social elite exploit their powerful positions to skew development in favour of urban areas. He contends that reliance on the urban resource base by the urban elite means that they use their influence and lobbying powers to support macro- and micro-economic policies that promote urban development over rural development. In essence, the urban bias theory reflects the rent-capturing influence of urban elites in areas of national development. Nevertheless, the 'urban bias theory' has been criticised. For example, Byres (1979) highlighted Lipton's lack of recognition of the power wielded by rural people by citing the example of India, while Van Arkadie (1978) argued that Lipton's proposition failed to capture urban poverty. Over time, some scholars have also expounded arguments on the theory. For example, Majumdar et al. (2004) observe from a non-lobbying perspective, that the informational advantage held by urban residents, as well as the electoral imperatives of governments wishing to retain power, result in the uneven allocation of resources between the rural and urban residents of a country. They identify factors contributing to the informational advantage to include more educated and wealthier urban residents, as well as a stronger urban focus in media reportage. Ades and Glaeser (1995) also add an important insight by demonstrating the contingent effects of autocratic regimes on urban bias theory. They argue that such regimes offer disproportionate political power to urban residents, compared with rural residents, in order to hold on to power. A critical factor here is the ability of the urban class to mobilise politically. In response to criticisms of his theory, Lipton collaborated with Robert Eastwood to argue that structural adjustment and economic liberation programmes had failed to achieve their desired effects in

the poorest countries (Eastwood and Lipton 2000). Furthermore, in a re-statement of the theory, Lipton ([2005], as cited in Jones and Corbridge 2010) reiterated his view that urban-biased government policies had led to 'substantially worse rural than urban outcomes' in the developing world.

For SSA, urban bias is seen as a by-product of colonialism. Colonial policies are believed to have led to a high degree of landlessness and land inequality, which in turn badly influenced productivity, distribution of public expenditure, and political and ethnic instability (Carter 2000; Sokoloff and Engerman 2000; Frankema 2005; Allcott et al. 2006). In addition, the colonial inheritance of dualistic economies fuelled an emergence of industrialisation policies in SSA, with the aims of steering economies away from export dependence to the path of industrialisation (Bezemer and Headey 2008). To this end, Bezemer and Headey (2008, p.1343) have singled out urban bias as *"the largest institutional impediment to growth and poverty reduction in the world's poorest countries"*. Progressing the argument on the urban bias theory in SSA, Bates (1984) shows how governments used instruments of taxation to channel resources from rural areas to urban areas. The foundations of Bates' analysis rest on the notion that governments devised means of diverting revenues from agrarian sectors in order to keep the largely non-farm but powerful urban populace happy. This was achieved through measures such as manipulating exchange rates against export-bound farm products and setting administratively low domestic prices for exportable products and selling them later at prevailing world prices in order to make a profit.

In the wake of an increasing scale of urban poverty and an era of rapid urbanisation, one might be tempted to ask whether the theory still holds in the context of contemporary urbanisation, and to what extent? Answering such a question might be out of the scope of this study. However, from the perspective of this study, the relevance of this theory is expressed in order to shed light on the dynamics of contemporary urbanisation. For example, the analysis by Majumdar et al. (2004) remains a suggestive reminder of how the roots of contemporary urbanisation could be tied to the urban bias theory. Importantly, they demonstrate that especially in bad economic times, the effects of urban bias become more profound resulting in an increase in rates of urbanisation as cities expand to accommodate more people who want to enjoy the enhanced provision of public goods in urban areas. This assertion re-echoed the view of the World Bank Report (2000, p.130) which argued that *"Africa's pattern of 'urbanisation without growth' is in part the result of distorted incentives*

that encouraged migrants to exploit subsidies rather than in response to opportunities for more productive employment".

2.6.2 Utopianism and sustainable development.

Utopianism, just as sustainable development, is a contested concept with multiple meanings (Garforth 2009). Thomas More's (1516, cited in Sarakemsky 1993) novel *Utopia* advanced a generative paradox which has been influential in introducing the distinction between the good place (eu-topia) and the no-place (ou-topia) based on which the utopian concept has been expounded further. Subsequently, in her work on the *History of Utopian Thought* published in 1922, Hertzler (1922, p.268) defines utopianism as: "*the role of the conscious human will in suggesting a trend of development for society or the unconscious alignment of society in conformity of some definite ideal"*. Perhaps one of the most renowned theorists, Bloch's (1986) seminal theorisation of the utopian concept, *The Principle of Hope*, frames the utopian inquiry around a philosophy of hope that conceptualises the utopian concept as a way of 'dreaming forward'. From an interdisciplinary perspective, Levitas (1990, p.191) defines utopia as *"the expression of desire for a better way of living and being"*. Proponents of the utopian theory highlight its tendency to advocate for holistic and long-term thinking about the 'good society' within a democratic boundary (Levitas 2007). Critics, however, take issue with the utopian theory because its ideals are deemed to be paradoxical as they tend to advance incommensurable practices and values (Hong and Vicdan 2016).

Like sustainable development, the utopian concept could be characterised as a liminal discourse. In this case, liminality is expressed as *"the highly provisional in-between moment, implicated in that-which-has-been but gesturing towards that-which-is-to come"* (Mondal 2011, p.430). Thus, the plausibility of characterising sustainable development as *utopian* lies in its vision of an ideal developmental state that is definitionally difficult to instantiate. Importantly, this alignment of sustainable development with the utopian concept is an analytical one, rather than a descriptive one. Thus, based on the Brundtland Commission's definition of sustainable development, the potential connection between SD and utopianism is evident. For instance, in making the case for development without compromising the ability of future generation to also develop, SD, as a concept, assumes a utopian posture where the developmental realities of the current generation, whether critical or not, are not prioritised over that of the future generation, but are rather based on a perfected state of

egalitarianism. In other words, the prosperity of the future generation is a sequential outcome of the current generation. In his study on a new conceptual framework for sustainable development, Jabareen (2008) shows that sustainable development advances a vision for perfect human habitats which transcend ecological, social and political spheres. However, as a political agenda which is signed onto by national governments, the images of the utopian visions of sustainable development as a concept could potentially be obscured from the realm of public debate and interrogation (Levitas 2007) as they are complex and require multiple steps to be in motion simultaneously. Perhaps this should be a source of worry in the context of the sustainable development-utopia connection.

In sum, the paragraphs above have shown the importance of the links between sustainable development and the utopianism concept to the current study as it reveals, among others, the tension that the utopian features of SD as a concept sets up between future and present generations in the use of resources. For much of SSA, where poverty is pervasive and developmental levels are low, perhaps these tensions projected by the utopian vision of SD make its realisation a hollow dream. Essentially, in understanding the theoretical and practical implications of the sustainable development concept in SSA, one can, and must agree with Hertzler's axiomatic assertion that *"after all utopia is not a social state, it is a state of mind"* (1922, p.314). To some extent, all this explains why, just as with the utopian concept, SD, as a concept, remains a contested one. Nevertheless, despite its utopian tendencies, and consistent with Bloch's (1986) work, SD as a concept offers 'hope' through its clarion call for the redistribution of political power and equitable access to natural resources in order to guarantee humans a decent standard of living.

2.6.3 Natural capital and sustainable development.

First used by renowned economist, David W. Pearce, natural capital refers to the *"set of all environmental assets"* (Pearce 1988, p.599). While the importance of the natural capital concept is evident in its broad uptake in the economic literature, critics argue that it encourages a narrow perspective of the environment by reducing it to a mere asset with an economic value (Missemer 2018). In terms of its measurement, an indicator increasingly used to measure natural capital as a proxy for environmental quality is the ecological footprint (EF) (Solarin and Bello 2018). The ecological footprint reflects the extent to which people make demands on the environment by measuring the ecological assets that people require to

provide their needs (Mancini et al. 2017). The EF is measured in relation to *bio-capacity* (BC), which reflects the ecological budget in terms of biologically productive land and sea areas as used in EF calculations (Borucke et al. 2013). As such, there is ecological deficit when EF is higher than BC, an indication of unsustainability; while there is ecological surplus when EF is less than BC, an indication of sustainability (Ulucak and Bilgili 2018). Exploring the links between ecological quality and economic growth in the context of sustainable development, Holden et al. (2014) have argued that countries experiencing higher rates of socio-economic development (measured through HDI) are likely to have achieved that by expending significant amounts of ecological and renewable energy resources.

The natural capital concept is integral to two critical economic interpretations of sustainable development which are fundamental to the debate on how best to achieve it. The debate on weak and strong sustainability explores the relationship amongst the economic, environmental, and social dimensions of SD by the extent to which natural capital can be substituted with man-made capital (Ekins 2011; Wu 2013). The first approach, 'weak sustainability', takes its roots from the pioneering studies of renowned economists Robert Solow (a Nobel Laureate) and John Hartwick (a resource economist) in the 1970s (Neumayer 2013). Proponents of weak sustainability contend that the level of substitutability between natural capital (for example, biodiversity) and man-made capital (for example, socio-economic infrastructure) should be unbridled and is sustainable as long as the quantity of capital stocks does not depreciate (Pillarisetti 2005; Fischer et al. 2007; Neumayer 2013; Greasley et al. 2014). More to the point, they argue that providing adequate goods, services, and infrastructure compensates for any depletion or pollution of environmental resources. In the context of this research, their argument would mean that rapid urbanisation and its impact on the ecological integrity of the earth is sustainable provided it results in economic growth. Conversely, some proponents of 'strong sustainability' argue that natural and man-made capital are meant to complement each other but are not substitutable (Daly 1995; Neumayer 2013). To put it succinctly, they argue that some natural capital cannot be substituted or replaced by any other form of capital due to their significance in maintaining ecological systems, as well as the irreversibility and uncertainty of such natural capital (Ekins et al. 2003). In the context of this research, their view implies that rapid urbanisation cannot be considered sustainable if it threatens the existence and functions of vital components of natural capital.

2.6.4 Equity and sustainable development.

The concept of equity is deeply embedded within the definition and praxis of sustainable development. Equity in the sustainable development context is premised on the concept of 'distributive justice' which can be defined as how opportunities and costs in life are distributed among members of a society (Armstrong 2012). Equity in the sustainable development discourse can be conceptualised in at least two ways: inter-generational equity and intra-generational equity (Kverndokk et al. 2014). From an inter-generational perspective, meeting the needs of the present generation should not compromise opportunities for future generations to realise the same. From an intra-generational perspective, there should be fairness in the distribution of resources within any contemporary generation. The intra-generational perspective, thus, assumes that for example, across social groups differentiated by income, gender, age, etc., there should be equitable access to opportunities for meeting basic needs that include, but are not limited to, employment, housing, education, and health (Trudeau 2018).

While equity remains a central tenet of sustainable development, the ability to realise it in practice is in question. Recent scholarship on sustainable development has elaborated on the equity concept and explored opportunities and barriers to achieving it practically. For example, Trudeau (2018) has argued that achieving equity in sustainable development practice hinges on the capacity of relevant institutions to champion this cause, demonstrate such commitment through the prioritisation of the concept at the onset of the development process, and the extent to which policies and resources are provided to support this cause. Accordingly, issues of social equity and social justice are widely seen as critical in any empirical analysis of sustainable development (Pearce et al. 1990). Of particular concern in the SSA context, is how endogenous and exogenous forces such as globalisation, market forces, and poverty may influence social equity. Thus, the interest here is for exploring how the interaction between urbanisation and sustainable development affects distributive justice in an intra- / inter- generational context. Equity in access to opportunities from the interaction of sustainable development and urbanisation as manifested in urban systems will, therefore, relate to how the engagement and participation of different actors are guaranteed.

2.6.5 Human well-being and sustainable development.

There is an explicit acknowledgement that human well-being (HWB) is of crucial importance in the analyses and measurement of sustainable development (McGillivray and Clark 2006). Nevertheless, like sustainable development, the human well-being concept is ambiguous as there are multiple definitions used to explain it. For example, HWB has been used to describe an objective measurement of people's living circumstances (Collard 2003). Others (for example, Mee-Udon 2009) have described HWB as a function of the meaningful and sustainable interactions between people and their physical and social environments. Thus, a parsimonious description consistent with the principles of sustainable development is used for the present discussion in which human well-being is described as *"a state of being with others, which arises where human needs are met, where one can act to meaningfully pursue one's goals and where one can enjoy a satisfactory quality of life"* (McGregor 2008, p.1).

In the context of sustainable development, the centrality of human well-being is embedded in multiple development agendas that range from social justice to environmental sustainability (Prescott-Allen 2001). In terms of its measurement, the ambiguity of the HWB concept means that the literature (see, for example, Diener et al. 2009; Scott 2012) acknowledges that its measurement could be both subjective and objective. The objective components of well-being which are usually measured quantitatively denote the material and social characteristics of a society as reflected in dimensions such as employment and income, education, housing, and health (King et al. 2014). However, the subjective components of well-being are captured qualitatively to reflect how one individual thinks and feels about life circumstances, usually in terms of satisfaction with specific dimensions (King et al. 2014). Importantly, Hagerty et al. (2001) have highlighted the importance of both subjective and objective components if the totality of life experiences is to be captured when analysing human well-being in the context of sustainable development. They argue that *"a person may report a high level of subjective well-being, despite environmental conditions bad enough to significantly shorten life expectancy, hence affecting immediate future quality of life. Similarly, objective quality of life conditions (for example, health and material possessions) of a person may have very little to do with subjective well-being. For example, a person may be wealthy, yet feel very dissatisfied with life"* (p. 8-9). The literature has reflected on the interconnectedness of human well-being and sustainable development in the context of socio-ecological systems. For example, Costanza et al. (2007) have developed a 'basic needs and capital inputs' model that conceptualises how natural capital together with built, human, and social capitals are required as inputs in the context of meeting human needs. The discussion has, therefore,

highlighted the critical influence of human well-being when analysing sustainable development as consistent with the 'meeting basic needs' requirement of the sustainable development definition advanced by the Brundtland Commission (WCED 1987).

2.6.6 Socio-ecological systems theory.

With the growing recognition of the bi-directional relationship between urbanisation and sustainable development (Lwasa 2014; Zhao and Wang 2015), a concomitant challenge is how this interaction will affect the overall stability of urban systems, and in the context of this study, how it affects human well-being and inter- / intra-generational equity. Furthermore, according to Feldstein and Glasgow (2008), the implementation of any sustainable development or sustainability policy programme is hindered when there is a lack of a comprehensive and practical conceptual framework within which the key features and predictors of sustainability are integrated. Thus, addressing the complexity of the inter-relationship between urbanisation and sustainable development will require their organisation in a way that allows these complexities to be addressed based on sound evidence. Increasingly used to understand complex systems, socio-ecological systems (SES) theory emerged from the recognition of *"the close interactions between society, in terms of social-economic systems and natural systems"* (Petrosillo et al. 2015, p.1). As a precursor, the meaning of 'system' must be defined in order to examine SES adequately. Thus, a 'system' is defined here as an abstract appreciation of inter-related components which function as a whole (Schelbe et al. 2018). Subsequently, SES theory emphasises how the biological and biophysical processes of ecosystems interconnect with the cognitive, socio-cultural, and institutional processes of human systems (Berkes and Folke 1998; Adger 2006). In this context, the socio-ecological system is defined as an integrated human and natural system where feedbacks exist between the biophysical and human components (Ostrom 2009). Central to the SES perspective is holistic thinking that assumes that the socio-economic and ecological elements of sustainable development are interchangeable (Bastianoni et al. 2016). Reflecting on the interconnectedness of sustainability as a concept and socio-ecological systems, an extract from the United States Government Executive Order 13514 on federal leadership in environmental, energy and economic performance (2009, as cited in Stahl and Bridges 2013, p.551) argues that the general intent of sustainability *"is to create and maintain conditions under which humans and nature can exist in productive harmony that permit fulfilling the social, economic and environmental requirements of present and future*

generations". This creates a challenge of developing a means to help streamline sustainability across multiple scales (National Research Council [NRC] 2011). This challenge, according to the literature (for example, Summers and Smith 2014), is premised on the need for a unifying approach that connects scientific information and the normative values of sustainability.

From the foregoing, a variety of frameworks have emerged as viable options for diagnosing and understanding the sustainability of socio-ecological systems (Partelow 2018). Among the several frameworks that have been adopted to reflect the diverse research fields that are underpinned by socio-ecological systems is the DPSIR (Driver-Pressure-State-Impact-Response) framework (Petrosillo et al. 2015). The DPSIR framework holds promise to help organise complex socio-environmental problems and enable conceptualisations across socio-ecological systems (Gregory et al. 2013). It was originally developed by the OECD (1994) and subsequently enhanced by the European Environment Agency ([EEA] 1995) to help assess progress towards sustainable development by facilitating the identification of cause-effect relationships between human and natural systems (Smeets and Weterings 1999; de Stefano 2010). For proponents of the DPSIR framework, its strengths include potential for the integration of knowledge across different disciplines that allows for the gap between scientific disciplines to be bridged, and for the links between policy and management to be enhanced (Svarstad et al. 2008; Tscherning et al. 2012; Lewison et al. 2016). Critics, however, point to its limitations including the possibility of a mechanistic oversimplification of complex systems and the challenge of dealing with variables that may act both as a driver and pressure (Klijn 2004). The literature (for example, Bradley and Yee 2015, para. 2) recommends the application of a DPSIR framework to *"capture, organise and visualise the environmental, social and economic outcomes of human decisions"*. A gap in the literature relates to the application of the DPSIR in a holistic spatial context. The literature on conceptualisation and assessment of socio-ecological systems using the DPSIR framework has focused on its application in human and natural systems. For example, Gisladottir and Stocking (2005) developed a conceptual framework model based on DPSIR in order to study the effectiveness of land degradation control measures. Nilsson et al. (2009) have also used DPSIR as a framework for strategic environmental assessment. Furthermore, Agyemang et al. (2007) have used DPSIR to organise information on environmental degradation in Ghana. From these examples, it appears that the application of DPSIR framework is mainly dominated by research on environmental impacts. Critically, due to its potential for

integrative and multi-dimensional assessment, the literature (for example, Pintér et al. 2005; Svarstad et al. 2008; Tscherning et al. 2012; Dizdaroglu and Yigitcanlar 2014) suggests that future research should include an application of the DPSIR framework that focuses on the conceptualisation and assessment of urban systems in the context of sustainability. Thus, considering the lack of a comprehensive theoretical framework based on which the complexities of sustainable development could be holistically understood (Jabareen 2008), a socio-ecological systems approach (DPSIR) is useful as a framework for advancing a holistic appreciation of urbanisation and sustainable development in a way that facilitates the inclusion of all components relevant for decision-making. In the context of this study, the inherent strengths of the DPSIR framework (including: its potential to organise and integrate knowledge across diverse disciplines; its potential to facilitate scientific communication by structuring and simplifying complex problems; its potential to establish cause-effect relationships; and its potential to facilitate the clarification and comprehension of the inter-relationships between disparate concepts [Lewison et al. 2016]), mean that it can contribute to empirical research on urbanisation and sustainable development by organising their inter-relationships in an integrated manner.

2.6.7 Towards a conceptual framework for understanding the inter-relationships between urbanisation and sustainable development in Ghana.

2.6.7.1 Theoretical assumptions.

Following Yang (2010), establishing assumptions are essential to designing a conceptual framework that will help understand the inter-linkages between the two concepts being studied. Thus, from the strands of literature reviewed on the distinct processes of urbanisation and sustainable development so far in this thesis, the following assumptions are made:

1. There is a bi-directional relationship between urbanisation and sustainable development which manifests at the spatial level of urban areas but transcend physico-administrative boundaries (see for example, Simon 2010; Gong et al. 2012; Peter and Swilling 2012; Turok and McGranahan 2013; Wu 2014; Zhou and Wang 2015; Zhou et al. 2015).

2. While potentially utopian, sustainable development as a concept assumes a limit on the extent of social, economic, and environmental development within which human well-being can be guaranteed to an acceptable standard and inter- / intra- generational equity can be

maintained (see for example, Prescott and Allen 2001; Levitas 2007; Holden et al. 2008; Jabareen 2008; Sassen 2011; Kverndokk et al. 2014; Trudeau 2018).

3. The urbanisation process results in radical changes to the landscape and demography of urban systems which have implications for achieving sustainable development objectives (see for example, Parnell et al. 2007; Duh 2008; Seto et al. 2010; Wu 2014; Samal and Gedam 2015; Cobbinah et al. 2015a; Pauleit et al. 2018).

4. The nature (i.e. pace) of the urbanisation process affects its interaction with the sustainable development process and has broader implications for human well-being and intra- / inter-generational equity (see for example, Biswas 2006; Duh 2008; Bryceson et al. 2009; Darkwah and Cobbinah 2014; Cloete 2015).

5. Endogenous and exogenous forces (including poverty, inequality, globalisation, resource use) underpinning urban systems determine how the interactions between urbanisation and sustainable development will affect human well-being and intra- / inter-generational equity (see for example, Prescott and Allen 2001; Lee and Zhu 2006; Peter and Swilling 2012; Afranie and Ahiable 2011; UN-Habitat 2014; Le Gales 2016).

6. The interaction between urbanisation and sustainable development can be understood from within a socio-ecological framework by selecting appropriate indicators (see for example, Dizdaroglu and Yigitcanlar 2014; Turok and Borel-Saladin 2014; Petrosillo et al. 2015; Bastianoni 2016; Lynch and Mosbah 2017; Partelow 2018).

2.6.7.2 DPSIR conceptual framework for understanding urbanisation and sustainable development in Ghana.

The processes of urbanisation and sustainable development, as well as the socio-ecological systems theory explicated in the previous sections, offer the points of departure based on which a conceptual framework for understanding urbanisation and sustainable development in Ghana is premised. As a result, a conceptual framework based on the DPSIR concept (shown in Figure 2.4) is proposed to organise and understand the interactions between urbanisation and sustainable development from a socio-ecological perspective. The conceptual framework is premised on a dynamic interplay between the forces of urbanisation,

and the economic, social, and environmental dimensions of sustainable development, herein referred to as ‘drivers’. The next component ‘pressure’, reflects the factors that reinforce the manifestation of the drivers identified. The next component, ‘state’, captures the system-wide influences of the pressures identified. The next component, ‘impacts’, reflect the measurable impacts of the first three components, based on relevant indicators, as well as subjective experiences. The final component, ‘responses’, capture the societal, corporate, and institutional responses to the identified drivers, the pressures that reinforce their manifestation, and the mitigation of the state and impacts. Essentially, the DPSIR-based conceptual framework proposed is related mainly to the interaction between urbanisation and sustainable development. It assumes that there are endogenous and exogenous ‘pressures’ (poverty, globalisation, resource use) which influence the interactions between urbanisation and sustainable development, altering the ‘state’ of system characteristics (landscape, demography, human well-being) in the process. These then create measurable ‘impacts’ (land cover, urban form, population, living standards) of which the framework assumes a set of mitigating ‘responses’ (government, corporate, citizen) to manage the interactions into more sustainable outcomes. By proposing a conceptual framework, this research attempts to present a more holistic understanding of urban sustainability in the African context, offering a framework within which knowledge can be organised, and recommendations can be made on strategies for urban sustainability transformation.

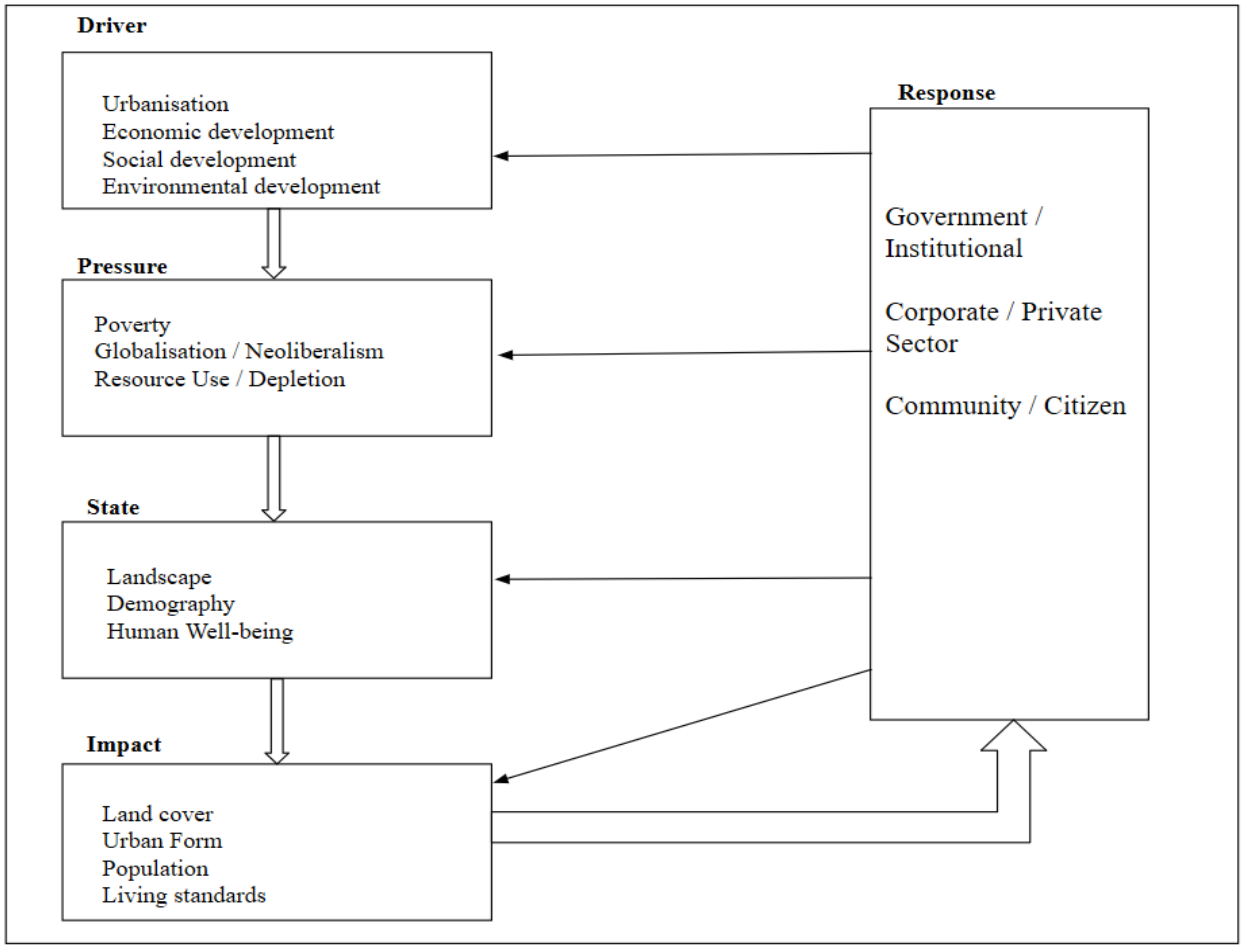

Figure 2.4: DPSIR-based conceptual framework applied to this study.
Source: Author, as modified from OECD (1994), EEA (1995) and IEHIAS (2019).

Chapter Three

3. Data and Methods

3.1 Introduction

In this chapter, the primary research methods engaged in collecting and analysing data for this study are presented. Considering the already highlighted trans-disciplinarity of sustainable development, as well as its complex inter-relationships with urbanisation, a pragmatic philosophical viewpoint that offers freedom from "*the forced-choice dichotomy between positivism and constructivism*" (Creswell and Plano Clark 2007, p.44) is assumed for this study. Therefore, a positivist approach (supports quantitative research) which assumes that the external world is made of a singular objective reality that is not aligned to human perception (Poortman and Schildkamp 2012), and a constructivist approach (supports qualitative research) that seeks a social construction of realities (Florczak 2014), are both adopted to analyse the interactions between sustainable development and urbanisation in Ghana.

In general, given the focus of this research, and consistent with the philosophical viewpoint assumed, a mixed-method approach and case study design are adopted in this study. The methods used in collecting data include quantitative questionnaires, field observations, satellite data analysis, and documentary analysis. Data collection was guided by the research questions set out in Chapter One and took place throughout the study period. The field trips conducted as part of this study took place in stages. The first field trip was a pilot study which took place from October to November 2016. The pilot study enabled an analysis of the wider research project, and also provided the opportunity to test the validity and reliability of some of the research tools before designing an in-depth study. The primary data collection stage took place from January to March 2018. The amount and types of data used in this study include: (i) 624 questionnaires; (ii) four sets of satellite imagery; (iii) two urban policy documents; and (iv) numerous published data and grey literature from websites. The main locales for field data collection were Kumasi and Obuasi (which are located in central Ghana) as shown in Figure 3.1. In addition, Appolonia City, which is located in southern Ghana, is also shown in Figure 3.1.

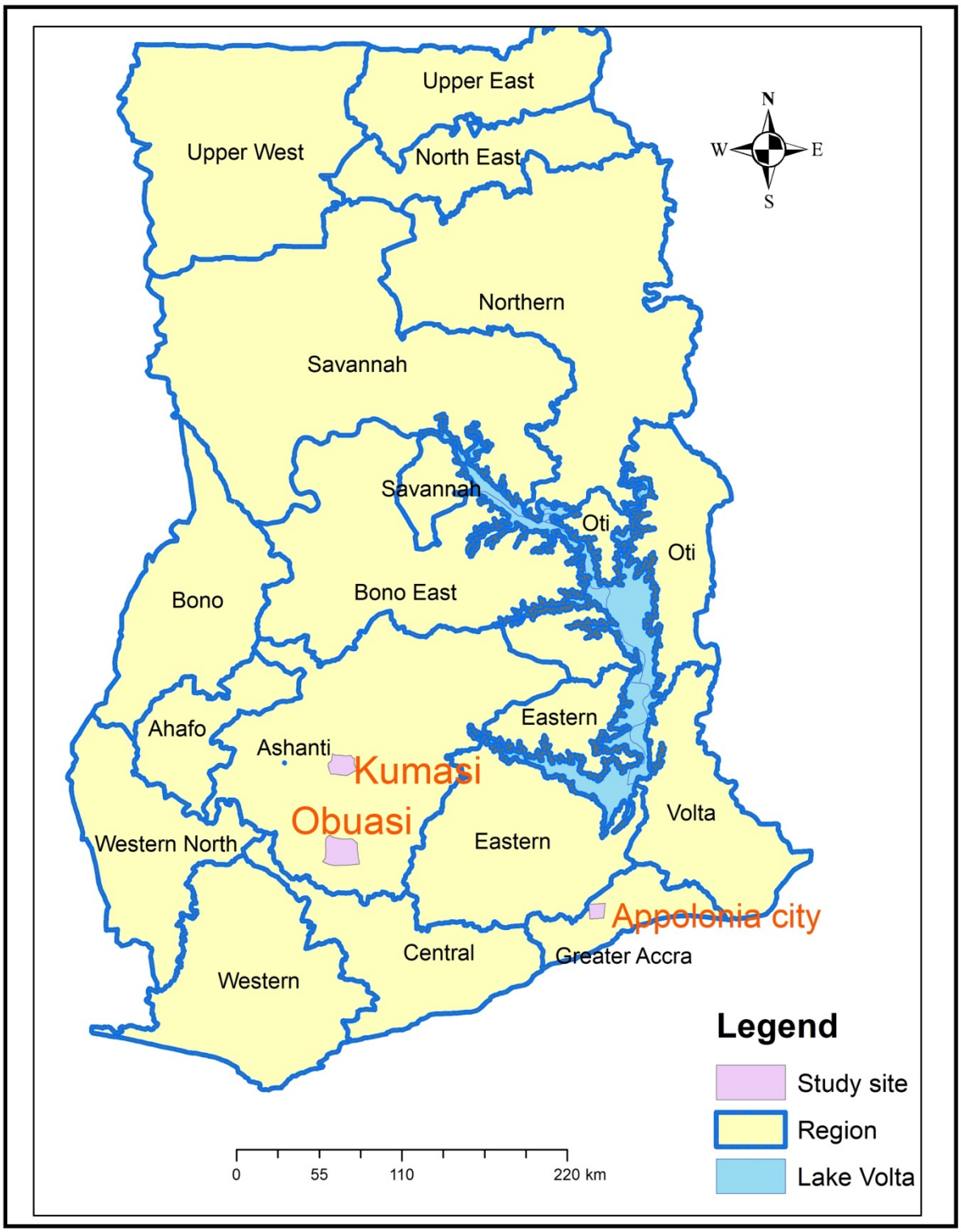

Figure 3.1: Map of Ghana showing Kumasi, Obuasi, and Appolonia City.
Source: Adapted from Anarfi et al. (2020).

3.2 Methodological choices

In alignment with the pragmatic philosophical viewpoint adopted, a mixed-method approach, defined as *"an approach to research in the social, behavioural, and health sciences in which the investigator gathers both quantitative (closed-ended) and qualitative (open-ended) data, integrates the two, and then draws interpretations based on the combined strengths of both sets of data to understand research problems*" Creswell (2015, p.2) is used in this study. The usefulness of a mixed-method approach in this study is characterised by the ability to synergistically combine available methods in order to provide complete knowledge that is necessary to inform theory and practice (Burke-Johnson and Onwuegbuzie 2004). Critically, the integration of qualitative and quantitative data in the mixed-method design adopted is intended to achieve a fuller understanding of the research questions.

This study is premised on an overarching collective case study of urbanisation and sustainable development in Ghana, as well as two instrumental sub-case-studies which are designed to provide a comparative analysis of the interactions between urbanisation and sustainable development at the local urban level (Kumasi and Obuasi), and to provide an overview of sustainable city development (Appolonia City) in Ghana. In this thesis, a case study is defined as *"an empirical enquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident"*, and it *"relies on multiple sources of evidence"* (Yin 1994, p. 13). In this context, an instrumental case study examines a particular case in order to gain broader insights, while a collective case study builds on an instrumental case study by examining multiple cases concurrently or sequentially to deepen understanding of a particular phenomenon (Stake 1995). Despite the difficulties associated with case studies, which include: complexities in scoping and designing case studies such that they adequately answer the research questions; accumulation of copious amounts of data; difficulty in making generalisations; and time-consuming tendencies (Yin 1994; Cavaye 1996; Darke et al. 1998); the case study approach in this study is expected prove advantageous by using diverse data collection and analysis methods to study the urbanisation and sustainable development processes in Ghana.

Within the case study setting, archival research was used to: (i) frame analysis of urbanisation and sustainable development in Ghana; (ii) analyse data on local level urbanisation and socio-

economic development; and (iii) analyse urban-related policy documents in Ghana. In this context, archival research involves the analysis of data that have been generated and stored primarily for purposes other than academic research (Heng et al. 2018). Unlike traditional research which uses prospective data by following processes which include generation of research question, research design, and data collection; archival research uses pre-existing data which means that data are collected before other research steps (Heng et al. 2018). Archival research uses administrative records and documents as the primary source of data. A key strength of archival research revolves around research replication, especially when publicly-accessible data are used. In this case, archival research promotes transparency and replicability of research as other researchers could attempt to replicate data analysis by using the same dataset and procedures. However, when archival data is privately-held, there is a potential lack of transparency as it becomes more difficult for other researchers to verify the correctness and reproducibility of the data analysis. Consequently, the archival data used in this research were publicly-accessible. Furthermore, remote sensing software was used to analyse landscape urbanisation through satellite data analysis, while a face-to-face survey method was adopted to explore the perceptions of citizens. A survey, as used in this study, is defined by Bryman (1989, p.104) as *"the collection of data on a number of units with a view to collecting systematically a body of quantifiable data in respect of a number of variables which are then examined to discern patterns of association"*.

3.3 Data collection

According to Johnson and Turner (2003, p.299), *"data collection methods should be combined so that they have different weaknesses and so that the combination used by the researcher may provide convergent and divergent evidence about the phenomenon being studied"*. Therefore, the next sub-sections will introduce the main data collection instruments used in this study.

3.3.1 Questionnaire administration.

According to Allery (2016, p.234), a questionnaire is *"a series of pre-set questions, designed to address specific research questions, allowing a researcher to collect the same information, in the same way, from every respondent"*. The literature reviewed in Chapter Two alludes to the importance of sociological interpretations of citizens' perceptions and preferences, and

how they shape their actions and way of life (see, for example, Macke et al. 2018). Also, it suffices to say that the rapid nature of contemporary urbanisation means that managers of urban areas are not sufficiently in sync with the changing dynamics of human values, and in the context of this study, the meanings and values that citizens attribute to the various dimensions of sustainability. Understanding these preferences and perceptions, therefore, represents an ideal foundation on which citizen involvement in urban decision-making could be advanced (Delmas and Toffel 2004). As such, the survey instrument upon which this research is based was designed in such a way that useful information required to gauge the perceptions of citizens concerning the main themes could be extracted from the data.

3.3.2 Observation.

The two sites for the comparative sub-case-study were observed multiple times throughout the data collection phase in order to capture the reality on the ground regarding the prevailing urban conditions and everyday-life routines of the urban populace in the study sites. Participants were observed during surveys based on ethical considerations.

3.3.3 Documentary analysis.

Document analysis is the process of eliciting, understanding, and developing empirical knowledge through the systematic review and evaluation of printed and electronic material (Corbin and Strauss 2008; Bowen 2009). Merriam (1988, p.118) argues that *"documents of all types can help the researcher uncover meaning, develop understanding, and discover insights relevant to the research problem"*. Accordingly, the importance of document analyses in social science research, especially where it involves data from the national census, national policies, and public surveys, has been highlighted by scholars (see, for example, Matthews and Ross 2010). Documentary analysis was carried out in this research as a primary source of empirical data collection to complement other research methods (e.g., as ancillary data for land cover change analysis), and also for data triangulation purposes (see Bowen 2009).

3.3.4 Critical and systematic review of literature.

A critical review of literature was carried out to help guide this research and to achieve the different objectives of this study. The sources of data scoped included peer-reviewed journal articles and grey literature. Furthermore, consistent with suggestions about the difficulty of developing indicators for sustainability research that was highlighted in Chapter Two, a review of literature was conducted in order to help establish the indicators and related proxies that are appropriate for analysing urbanisation and sustainable development in Ghana. To this end, the Google Scholar database was searched for peer-reviewed articles published in scientific journals. The main search terms used in combination were 'urban sustainability assessment' and 'Africa'. The following filters were applied in order to streamline the search and identify the most relevant articles: (i) the article should be in English and it should have been published between 2010 (chosen to reflect the year in which Ghana became more urban than rural) and 2017 (chosen to precede the main field data collection period for this study in 2018); and (ii) the article should explicitly address urban or national sustainability assessment or indicators. Considering the scope of this study, the first 200 articles produced in the search were reviewed and the details of seven key articles based on which the indicators for sustainability assessment in this study were established are attached in Appendix 1. However, due to the already highlighted paucity of data on urban systems in SSA, the indicators or related proxies selected for sustainability assessment in this study have been based on factors such as data availability, measurability, relevance, as well as how they adequately facilitate answering of the research questions (see Joumard and Gudmundsson [2010]).

3.4 Ethics and integrity

Ethical considerations are essential to any research process irrespective of the nature of data collection. Flinders (1992) has highlighted the relationships among the utilitarian, deontological, relational and ecological ethical approaches; and aspects of research including recruitment, fieldwork and reporting. In general, ethical issues in this research were considered based on a utilitarian approach (see Flinders 1992) as participants were recruited based on informed consent, fieldwork was conducted in a manner that avoided or minimised negative externalities on participants, and the confidentiality of reports and participants were guarded.

3.4.1 Ethical issues in the questionnaire survey.

The issue of confidentiality in conducting interviews and face-to-face surveys is widely reported in the literature (for example, see Ensign 2003; Kidd and Finlayson 2006; Clark and Sharf 2007). A prominent source where confidentiality could be compromised is during the write up of interview or survey findings, especially where quotes have been used (Sandelowski 1994; Rowan 2000). Also, while anonymising participants could make them unidentifiable by the public, they could still be identified by colleagues who have taken the same survey based on the information given out (Allmark et al. 2009). In keeping with the duty of protecting participant confidentiality, consideration was given to the idea of using initials or pseudonyms to anonymise participants and also the possibility of changing easily identifiable details in reporting the findings, as recommended by Richards and Schwartz (2002). Participants were constantly reminded of their right to opt out of the survey at any stage or time.

The issue of informed consent in research has been raised by several commentators (see, for example, Ensign 2003; Walker 2007). Informed consent in the survey is particularly important if the earlier-mentioned issue of confidentiality is to be protected (Cowburn 2005). Thus, at the centre of scholarly recommendations on consent in the survey process is the need to adequately furnish participants with full details on the nature of the research, and more importantly, to secure a form of written consent (Cowburn 2005). Ensign (2003) also argues for the use of oral assent in exceptional cases, for example, when dealing with vulnerable groups. Thus, an ethical imperative of this research was ensuring that participants were well-informed about the key objectives and given reasonable time to review and reflect on them before consenting. In order to achieve this, participants were given research information and participant consent sheets in hard copies, which were to be read, understood, and signed. In a less-developed country such as Ghana, where literacy is not universal, the researcher explained the research objectives to less-literate participants in the local language before seeking consent. The informed consent of participants was secured before every face-to-face survey.

'Harm' in qualitative research has been widely discussed (see, for example, Saunders et al. 2015). Harm in qualitative research could range from 'blows to self-esteem' to threatening participants' interests, position or brand (Saunders et al. 2015). The main implications of

'harm' on a research process are its impact on access and quality of data (Bird and Spier 2008). Also, Bird and Spier (2008) go on to suggest that potential conflict of interest from the publication of a study could result in pressure from various stakeholders to revise or omit sensitive conclusions. At all stages in this research process, the issue of 'harm' was guided by the often-posed question by McCall and Simmons (1969, p. 276): *"to whom shall harm be done in this study, and in what magnitude?"*

From the onset, the researcher set out to identify health and safety risks and other risks of this research to both the researcher and participants. The main risk posed by the researcher was based on the reality that the researcher, as an 'outsider', was unknown to some participants / organisations, was likely to 'waste people's time', and could potentially make conclusions based on weak evidence. This was partly mitigated by the initial research trip, which helped the researcher to familiarise with the locations and network with some stakeholders. Risks to the researcher included the fact that findings could be unpopular amongst stakeholders when communicated. This was partly mitigated by being transparent in communications with them, helping to establish trust. No other significant risks were identified. It is important to note that the researcher did not set out to harm or expose any participant or organisation during the survey process or in the subsequent presentation of findings. During the survey, there was ongoing reflectivity (see Cohn and Lyons 2003; Shaw 2003) as the researcher always circled back in reflection at various points in order to connect and make sense of issues arising, and at the same time respond sensitively to the needs of participants. Also, participants were assured continuously of the researcher's commitment to high ethical standards by presenting a fair and honest account of each interaction. There were no complex ethical dilemmas as a result of this research. In general, all protocols in this research were conducted within the ethical framework approved by Bournemouth University. This involved undergoing training on research ethics, scrutinising the research plan to identify ethical hotspots and ways of mitigating any possible factors that might compromise the ethical integrity of the research, and also establishing a list of assumptions and expectations as an ethical boundary that showed the limits within which the research should be conducted.

3.5 Methodological choices specific to research objectives

The main aim of this study is to explore the relationship between urbanisation and sustainable development in the context of Ghana in order to make recommendations for urban

sustainability and to develop a conceptual model that could facilitate decision-making for the transition to sustainability. Thus, this section discusses the specific methodological choices made and organises them in relation to the specific objectives outlined in Chapter One.

3.5.1 Methods for Objective One.

Objective One[8] aims to apply a conceptual research framework that organises the interactions between urbanisation and sustainable development processes in an integrative and holistic manner to reflect the African situation based on the Ghanaian case. In the purview of the present research, the question arises as to the nature of the interactions between urbanisation and sustainable development in the African context. Therefore, in Africa where urbanisation is rapid and multiple developmental challenges abound (Cloete 2015; Cobbinah and Aboagye 2017), it is vital to present the real-life situation by devising a means of incorporating the main domains of urbanisation and sustainable development in a way that helps to identify the potential synergies and conflicts that must be managed and governed if progress is to be made towards achieving urban sustainability. Nevertheless, as established in Chapter Two, SD as a concept is complex and fuzzy, and there is a paucity of comprehensive frameworks based on which the complexities of SD could be holistically understood (Jabareen 2008). Furthermore, the trans-disciplinary nature of sustainable development means that the lack of a comprehensive framework of evaluation potentially undermines an understanding of its complex inter-relationships with the urbanisation process. Consequently, in building an integrated vision of urban sustainability in this research, the application of a conceptual framework is proposed. A framework has been described as an entity between a 'model' and 'method', that contains *"a (not completely detailed) structure or system for the realisation of a defined goal"* (Verbrugge 2019, para.4). Critically, depending on its use, a framework may consist of one or more models (Verbrugge 2019). A model represents a *"simplified representation of a system at some particular point in time or space intended to promote understanding of the real system"* (Bellinger 2004, para. 1). Norman (1983, apud Greca and Moreira 2000, p.5) defines conceptual models as *"precise and complete representations that are coherent with the scientifically accepted knowledge"*. Fundamentally, conceptual models are critical for integrating and representing existing and generated knowledge (Struss 2004).

8 Note: Objective One has already been achieved and presented in Figure 2.4. Therefore, it is presented here in order to ensure overall coherency and completeness of the methods used in achieving the objectives in this study.

The choice of a conceptual framework over other types of models discussed in Chapter Two was based on its strengths in presenting particular concepts and also in triggering policy responses (Todorov and Marinova 2011). This choice was also influenced by the scope of the research, as well as the limited financial and time resources available to carry out this research. According to Pearce (2008), developing a model enables a researcher to transcend a descriptive boundary into the explanatory. The conceptual framework applied in this research is intended to help achieve a coherent and more holistic view of urbanisation and sustainable development in the African context. As shown in the literature, different geographic regions have different local environmental, socio-cultural, and economic conditions. This implies that models developed for a particular geographic area cannot achieve comparable results when applied in another jurisdiction, as respective regions have different ways of perceiving and achieving their developmental objectives. Nevertheless, some commonalities exist among regions. Therefore, the integrated conceptual framework expounded here is not intended to represent a rigid code of the urbanisation and sustainable development processes, but rather to integrate knowledge from different sources in order to help operationalise the urban sustainability concept and make policy recommendations irrespective of the socio-economic differences between urban areas.

3.5.2 Methods for Objective Two.

Objective Two aims to evaluate the overall sustainable development situation and urbanisation patterns in Ghana. This was achieved in three parts. The first two parts synthesised extant literature in order to provide a review of urban challenges and an overview of sustainable development in Ghana. In order to assess the overall sustainable development situation in Ghana, this study followed the methods used by Holden et al. (2014). Four primary dimensions of sustainable development were identified from the Brundtland Commission's definition of sustainable development (WCED 1987; Holden et al. 2014). These are (i) safeguarding long-term ecological sustainability; (ii) satisfying basic human needs (iii) promoting inter-generational equity, and (iv) promoting intra-generational equity. Table 3.1 presents the indicators used to measure the primary dimensions and the threshold values suggested for sustainable development based on the target year of 2030. The sustainable development situation was, therefore, analysed based on threshold levels for indicators for which development was characterised as sustainable based on a four-dimensional space called 'sustainable development space' (Holden et al. 2014).

Table 3.1: Dimensions, indicators, and suggested 2030 threshold values for sustainable development.

Dimension	Indicator	2030 Threshold	Source of Data
(i) Safeguarding long-term ecological sustainability.	Yearly per capita ecological footprint.	Maximum 1.7 Global hectares (gha) per capita.	Global Footprint Network (2019); UNDP 2019a.
(ii) Satisfying basic human needs.	Human Development Index.	Minimum 0.630.	UNDP (2018; 2019; 2019b); World Population Review (2019).
(iii) Promoting inter-generational equity.	The proportion of renewable energy to total energy in primary energy production.	Minimum 27%.	Energy Commission (2016; 2018; 2019).
(iv) Promoting intra-generational equity.	Gini coefficient.	Maximum 40.	World Bank (2019a).

Source: adapted from Holden et al. (2014).

The following explanations are offered for the thresholds used in examining the sustainable development space. According to Holden et al. (2014), ecological footprint is strongly correlated with energy consumption and they used 2.3 gha per capita as an adjusted value based on the call for a 15% reduction in energy consumption by 2030 (WCED 1987; WWF 2008; WWF 2016). However, a threshold of 1.7 gha was used in this study to reflect worldwide average bio-capacity as of the end of 2018 (UNDP 2019a). The minimum HDI of 0.630 was chosen to reflect the minimum requirement a country must meet in order to safeguard the basic needs of its citizens and this was chosen as an average based on the threshold HDI for countries with 'medium human development'[9] (UNDP 2019a). The maximum Gini coefficient of 40 was chosen to reflect the target level set by UN-Habitat (United Nations 2010). Finally, the minimum 27% renewable energy reflects the proportion

9 According to World Population Review (2019), there are four tiers of the HDI: very high human development (0.8 -1.0), high human development (0.7 – 0.79), medium human development (0.55 – 0.69) and low human development (below 0.55).

needed by 2035 in order to be consistent with a 450 ppm CO_2eq stabilisation level recommended by the IPCC (2011). The sources of data consulted to evaluate sustainable development in Ghana are listed in Table 3.1.

For the third part of Objective Two, literature was reviewed in order to provide an overview and to assess the urbanisation situation in Ghana. The sources of data used are provided in Table 3.2. From these data, relevant information was extracted and presented in the form of tables and figures in order to guide the discussion of the overall urbanisation situation in Ghana.

Table 3.2: Source of data for dimensions of urbanisation in Ghana.

Dimension	**Source of data**
(i) Urban population, urbanisation level, and urbanisation rates in Ghana vs. World.	Cobinnah et al. (2015a) as adapted from UNDESA/PD (2012) and UNDESA/PD (2013)
(ii) Urbanisation patterns in the major urban areas in Ghana, 1970- 2010.	Cobinnah and Niminga-Beka (2017) as adapted from GSS Records (2012; 2013).
(iii) Contribution of rural-urban migration and natural population growth to urbanisation.	Ghana Statistical Service (2014a).
(iv) Gross National Income data.	World Bank (2019b).

3.5.3 Methods for Objective Three.

Objective Three aims to provide a deeper understanding of the Ghanaian situation through a comparative urban sub-case-study that specifically: (i) examines the patterns of landscape and demographic urbanisation and the implications for sustainable development; (ii) evaluates the sustainable development situation based on recognised and relevant indicators from the literature; and (iii) explores urbanisation and sustainable development based on the subjective experience (perceptions) of citizens.

3.5.3.1 Study site selection.

Two urban areas in Ghana (see Figure 3.1) have been selected as study sites in a comparative sub-case-study that investigates the urbanisation and SD process in the African context. The first case study site is Obuasi, located in the Ashanti region of Ghana. From a mineral resource economy perspective, the choice of Obuasi is of particular importance. This is because it is the location of the oldest gold-mining shaft in Ghana (operated by AngloGold Ashanti), and until the first decade of the 21st century it was the principal mining hub in Ghana (Wan 2014). In 2014, AngloGold Ashanti halted its operations in Obuasi due to the reduced performance of the mine and operations resumed in the first quarter of 2019 (Ghana Chamber of Mines 2019). The closure of the mine had development implications for Obuasi and its environs as AngloGold's operations in Obuasi are a key source of employment generation (Ghana Chamber of Mines 2019). The lack of research on urbanisation and mining has also been highlighted in the literature (Gough and Yankson 2012). As a result, Obuasi is a good case study for understanding the nexus between sustainability and urbanisation in the context of a resource-based city. This is particularly important within SSA, a region where most economies are based on natural resource extraction (UNECA 2012a; Turok and McGranahan 2013). The second case study site is Kumasi, the capital of the Ashanti region of Ghana. Kumasi was selected as a case study for four main reasons; it is the second biggest city in Ghana (after Accra, the national capital); it is centrally located with extensive transport links to all parts of Ghana; it is the fastest growing city in Ghana (Oduro et al. 2014); and Kumasi's primacy, by virtue of being the capital of the Ashanti region, presents an opportunity to examine the opportunities for and challenges to sustainable urbanisation in a rapidly expanding urban area. Overall, it is expected that comparatively assessing the interactions between urbanisation and sustainable development in Kumasi and Obuasi will prove useful as both urban areas exist within Ghana, and will, therefore, have broadly consistent context, history, and policy settings. This potentially helps to separate the influence of national factors such as policy, and makes it possible to focus on the more specific characteristics of Kumasi and Obuasi.

3.5.3.2 Demographic and landscape urbanisation.

The first part of Objective Three sought to examine the patterns of landscape and demographic urbanisation and the implications for sustainable development in two urban areas in Ghana. In terms of demographic urbanisation, literature was reviewed in a desk study to extract population and migration data on the two urban areas (See Ghana Statistical

Service 2014a; 2014b; 2014c; 2019). In terms of landscape urbanisation, a spatio-temporal analysis of land cover change was conducted. The sustainability of landscape urbanisation was discussed in terms of whether urban expansion in Kumasi and Obuasi resulted in sustainable urban forms (based on the definitions and assumed benefits of urban form characteristics provided in Table 2.1).

3.5.3.2.1 Spatio-temporal analysis of land cover change (LCC).

Four sets of satellite imagery were used to analyse the extent of landscape transformation in the two urban areas over a period of 32 years (1986-2018). Critically, Ghana's equatorial climate and proximity to the Gulf of Guinea result in the presence of significant cloud cover (50-80%) on satellite imagery for most parts of the year (see Coulter et al. 2016). Therefore, the imagery for this study were carefully selected to ensure that there is less cloud cover such that any further processing required would be within the expertise of the researcher and the scope of this study. The extent of landscape transformation in Kumasi meant that an arbitrary area of interest was demarcated as a buffer of 8 km from the official metropolitan boundary. This was to ensure that the full urban extent, both within and outside the official boundaries, was accounted for. Specifically, the 8-km boundary was chosen to reflect areas within what is now referred to as Greater Kumasi. A buffer below 8 km would cut off areas that fall under Greater Kumasi, while a buffer beyond 8 km would result in large swathes of land well outside Greater Kumasi being captured. The nature of landscape transformation in Obuasi, however, meant that the area of interest was limited to the official municipal boundary. The characteristics of the satellite imagery used are presented in Table 3.3. In terms of characteristics of the sensors used to acquire the images, the radiometric resolution[10] is as follows: Landsat 5 TM and Landsat 7 ETM+ have radiometric resolutions of 8 bits (0 - 255 brightness values), and Landsat 8 OLI_TIRS has a radiometric resolution of 12 bits (up to 4096 brightness values) which is transformed into 16 bits (up to 65536 brightness values) when processed into Level-1 data (Landscape Toolbox 2019a, 2019b, 2019c; University of Rhode Island 2019). In terms of spectral bands, the Landsat 5 TM has six 30m bands which cover the visible, near infrared and short-wave infrared areas of the electromagnetic spectrum, and one 60m thermal infrared band; Landsat 7 ETM+ has eight bands, including

10 Radiometric resolution describes the sensitivity of a sensor to electromagnetic energy. This means that the finer the radiometric resolution the higher its sensitivity to differences in reflected or emitted energy (Huete 2004).

six 30m bands which cover the visible, near infrared and short-wave infrared areas of the electromagnetic spectrum, one 60m thermal infrared band, and one 15m panchromatic band; and the Landsat 8 OLI_TIRS has eleven bands, including eight 30m bands which cover the visible, near infrared, short wave infrared, coastal / aerosol and cirrus areas of the electromagnetic spectrum, one 15m panchromatic band, and two 100m thermal infrared bands (Landscape Toolbox 2019a, 2019b, 2019c). The specific bands selected for the classification of the Landsat 8 OLI images (2018) were Band 2 (Blue [visible]), Band 3 (Green [visible]), Band 4 (Red [visible]), Band 5 (Near Infrared), Band 6 (Shortwave Infrared 1) and Band 7 (Shortwave Infrared 2). The specific bands selected for the classification of the Landsat 5 TM (1986) and Landsat 7 ETM+ (2000; 2010) images were Band 1 (Blue [visible]), Band 2 (Green [visible], Band 3 (Red [visible]), Band 4 (Near Infrared), Band 5 (Shortwave Infrared 1) and Band 7 (Shortwave Infrared 2). The spatial resolutions of all the image bands used in this study were 30 m. The Path / Row for the images were 194 / 55 (Kumasi) and 194 / 56 (Obuasi).

Table 3.3: Characteristics of satellite sensors and images.

Location	**Date**	**Satellite (sensor)**	**Specific bands used**
Kumasi	29/12/1986	Landsat 5 TM	1, 2, 3, 4, 5, 7
Obuasi	29/12/1986	Landsat 5 TM	
Kumasi	04/12/2000	Landsat 7 ETM+	1, 2, 3, 4, 5, 7
Obuasi	04/12/2000	Landsat 7 ETM+	
Kumasi	02/06/2010	Landsat 7 ETM+	
Obuasi	02/06/2010	Landsat 7 ETM+	
Kumasi	01/19/2018	Landsat 8 OLI	2, 3, 4, 5, 6, 7
Obuasi	01/19/2018	Landsat 8 OLI	

(a) Image pre-processing.

The Landsat imagery acquired was processed according to the United States Geological Survey (USGS) Level-1 Product Generation System, which involves precision and terrain correction where radiometric and geodetic accuracy are provided by *"incorporating ground control points while employing a Digital Elevation Model (DEM) for topographic displacement"* (USGS 2019, para.3).

(b) Image classification.

Critical to the success of the complex image classification process is the selection of a suitable classification system (Lu and Weng 2007). Accordingly, seven distinct LULC classes of interest to the researcher in the context of urbanisation analysis for the study areas were identified (based on a modification of the Anderson Scheme Level 1 method). These include water, urban / built-up, mixed woody vegetation, bare land, forest, mine sites, and agricultural land (Anderson et al. 1976), as described in Table 3.4. However, as Kumasi and Obuasi have different land cover characteristics, five classes were identified as the final land cover class types for analysis in both sites, which include water, urban / built-up, mixed woody vegetation, agricultural land, and forest; whilst additional two classes consisting of mine sites and bare land were identified in Obuasi.

Table 3.4: Land cover classes analysed.

LULC Class	Description
Water	Permanent open water, lakes, reservoirs, rivers, bays.
Urban / Built-up	Residential, commercial, industrial, transportation and utilities, mixed urban and built-up land, paved-over areas.
Mixed Woody Vegetation	Lower stature secondary growth vegetation and forest; gallery forests along rivers, woody savannahs with high vegetation cover, tree plantations.
Bare Land	Bare soil, quarry and disturbed lands, dirt roads, exposed rocks.
Agricultural Land	Farmlands, fallowing shrublands.
Primary Forest	Dense primary forest, high stature forest.
Mine Sites	Mine sites and mine tailing ponds.

Source: Adapted from Anderson et al. (1976).

The satellite images were classified by supervised classification, through the widely-used maximum-likelihood classifier (Eum et al. 2011). Using the ERDAS IMAGINE (version 15.0) software, spectral signatures were created from training sites on the satellite images by digitising polygons representing all the identified land cover types shown in Table 3.4. As shown in Table 3.5, a total of sixty ground reference points were collected using a Garmin Global Position System (GPS) device for the classification of the 2018 image in Kumasi and consisted of the following: water (2); urban / built-up (18); mixed woody vegetation (20); agricultural land (10); and forest (10). For Obuasi, a total of sixty ground reference points were also collected for the 2018 image and consisted of the following: water (4); urban / built-up (18); mixed woody vegetation (10); agricultural land (10); mine sites (8) and forest (10), as shown in Table 3.6. By using the area of interest (AOI) tools in ERDAS IMAGINE (version 15.0), half of the ground reference points were used to create training polygons and the remaining used for accuracy assessment. The total number of ground reference points used in all four image dates are summarised in Table 3.5 (Kumasi) and Table 3.6 (Obuasi). For the historical images (1986, 2000 and 2010), the training sites were digitised based on a careful study of the imagery, Google Earth historical aerial imagery (where available), topographical maps, local knowledge and previous studies. The selection of reference points was done for unchanged land cover areas only and juxtaposed with the ground reference points collected during the 2018 field work. In doing so, it was assumed that there was a historical permanence in land cover types such as built-up, some mine sites, and some agricultural land; therefore, they had not changed over the study period. For each image (1986; 2000; 2010), half of the reference points were selected randomly as training samples, and the remaining half was retained for accuracy assessment. The underlying principle in the digitisation of training polygons was that the Euclidean distance between the respective spectral signatures represents the level of separability of the signatures created for the various land cover classes. Overall, scholars have acknowledged the importance of sufficient and representative training samples in image classification (see Hubert-Moy et al. 2001; Chen and Stow 2002; Mather 2004), and Mather (2004) recommends a training sample size of 30 times the number of bands per class. Critically, the number of reference points used in classifying the 2018 images was lower than the ones used for the 1986, 2000, and 2010 images (see Tables 3.5–3.6). This is because the number of GPS ground reference points the researcher could collect from the field for 2018 was limited by logistical and access constraints. However, for the other years (1986; 2000; 2010) the researcher used what was learnt from the ground reference points for 2018, in terms of spectral recognition, to train more areas. This

was because the researcher could not go back in time to collect field data. Following the collection of training sites and signatures, the maximum likelihood classifier was run in ERDAS IMAGINE (version 15.0) software based on a feature-space non-parametric decision rule. The statistics on the general change in the proportion of the different land cover types (especially in the urban / built-up class) have been used to show the extent of land cover change due to the process of urbanisation.

(c) Accuracy assessment.

For any map generated through remote sensing data, it is vital that its accuracy is assessed (Lunetta and Lyon 2004). As mentioned earlier, half of the ground reference points collected during the field work (for 2018 imagery) and half of the randomly sampled points (for 1986; 2000; 2010) were used for accuracy assessment (see Tables 3.5–3.6). A confusion matrix was constructed for each land cover map for accuracy assessment purposes.

Table 3.5: Number reference points (RPs) in the land cover class types used for training and accuracy assessment for Kumasi, 1986 - 2018.

Year		**Water**	**Urban / Built-up**	**Mixed Woody Vegetation**	**Forest**	**Agricultural land**	**Total**
1986	*No. of RPs*	20	42	40	22	14	**138**
2000	*No. of RPs*	10	50	18	10	36	**124**
2010	*No. of RPs*	10	44	14	18	20	**106**
2018	*No. of RPs*	2	18	20	10	10	**60**

Table 3.6: Number of reference points (RPs) in the land cover class types used for training and accuracy assessment for Obuasi, 1986 - 2018.

Year		Water	Urban / Built-up	Mixed Woody Vegetation	Forest	Agricultural land	Bare ground	Mine site	Total
1986	*No. of RPs*	-	20	26	20	20	-	10	**96**
2000	*No. of RPs*	2	30	30	10	10	-	10	**92**
2010	*No. of RPs*	2	30	30	10	20	4	10	**106**
2018	*No. of RPs*	4	18	10	10	10	-	8	**60**

Note: '-' is placed where a land cover is not identified on the image for a particular year.

3.5.3.3 Assessment of sustainable development in study sites.

The second part of Objective Three aims to evaluate the sustainable development situation in two urban areas in Ghana based on recognised indicators from the literature. Indicators were selected to assess sustainable development in the study sites based on the earlier-mentioned criteria for indicator selection (see Section 2.4). Therefore, the choice of indicators selected was informed by their measurability, comprehensiveness, clarity, reliability, relevance, and most importantly, data availability (Joung et al. 2012). This selection was made using a combined expert and citizen approach where choices were made based on the researcher's expert judgement through the literature reviewed, together with the opinions on indicators expressed by citizens in a pilot study during the earlier stages of this research (see, for example, Pissourios 2013). Based on the centrality of human well-being in urbanisation and sustainable development discourses (as discussed in the literature review), the indicators were selected to capture the part of the sustainable development definition advanced by WCED (1987) which sought to safeguard the basic needs of society in a sustainable manner. The indicators selected were, thus, inspired by the Sustainable Development Goals and assessed on the extent to which they achieved the Millennium Development Goals. Sustainable development of the two urban areas was assessed primarily on the dimensions of the Human Development Index (HDI), for which urban level data were available, or where there was a

lack of data, proxies could be used. The selected dimensions of the HDI based on which sustainable development was assessed in the two study sites are presented in Table 3.7. Due to the lack of urban-level GDP, and also due to the contestations of GDP use as a measure of standard of living (see, for example, Costanza et al. 2009; Stiglitz et al. 2010), the levels of access to basic infrastructure and services in Kumasi and Obuasi were selected as proxy measures of standard of living (specifically, access to sanitation and water). Available and relevant data which sufficiently measured education included literacy level, pupil-teacher ratio (PTR), and gender parity index (GPI). Finally, available and relevant data which sufficiently captured life expectancy included Crude Death Rate (CDR) and Maternal Mortality Rate (MMR).

Table 3.7: HDI dimensions, indicators used and source of data.

HDI Dimension	**Indicators**	**Source of data**
Life expectancy	Crude Death Rate, Maternal Mortality Rate.	Ghana Statistical Service (2014a)
Education	Literacy level, Pupil-teacher ratio, Gender Parity Index.	National Development Planning Commission (2019)
Standard of living	Access to improved sanitation, Access to a sustainable water source.	National Development Planning Commission (2019)

3.5.3.4 Face-to-face survey of citizens perceptions in study sites.

The third part of Objective Three explores urbanisation and sustainable development in the two urban areas in Ghana based on the subjective experience (perceptions) of citizens. The study adopted a quantitative survey to explore the perceptions and attitudes of respondents in the study sites concerning selected dimensions of sustainable development and urbanisation. Critically, the face-to-face survey used in this study helped to mitigate the lack of disaggregated urban data for the study areas by facilitating the soliciting of information on important indicators of sustainability based on the experiential knowledge of citizens in Kumasi and Obuasi.

3.5.3.4.1 Questionnaire Administration.

The study used a questionnaire designed by the researcher. Questionnaires consisting of a combination of close-ended and 5-point Likert-scale questions and statements were administered to residents of Kumasi and Obuasi in a face-to-face survey from January to March 2018. The choice of orally-administered face-to-face surveys was to mitigate any bias due to low-level literacy and the technical nature of the concepts being examined. A previous pilot study conducted in November 2016 provided real-world responses, and the feedback was critical in designing the main survey questionnaire as it served as an initial pre-test through which the main aspects of the survey were considered. Before the main survey period, the draft questionnaire was discussed with one academic from the local university (KNUST) and a professional planner. The draft version was then administered to 5 residents in Ayeduase, a suburb of Kumasi in order to determine how the respondents would react to the questions and statements. The final pre-testing process led to the reconstruction of sentences where understanding was not very clear, and the reduction of survey questions from 35 to 28. Overall, the construction of the questionnaire took into account relevant literature on urban sustainability and was designed in such a way that citizens' understanding and experience of sustainable development and urbanisation was captured. The questionnaire consisted of five main parts. The first part collected demographic information of respondents including age, gender, level of education, length of residency, housing type, and household size. It was essential to gauge citizens' perspective of the various dimensions of sustainability based on their own life experiences. After all, as the Thomas theorem opines: "*if men [sic] define situations as real, they are real in their consequences"* (Thomas and Thomas 1928, p.571-572). Thus, the second part explored citizens' views regarding the extent of agreement (on a scale of 1-5) with statements on the various dimensions of sustainability. The third part sought the level of agreement of citizens on the subject of urbanisation (based on a scale of 1 to 5) by exploring their views on issues such as the extent of demographic and landscape change, and the extent to which the level of development was commensurate with rates of urbanisation. The fourth part of the questionnaire explored attitudes towards urban sustainability, which required responses of 'yes', 'no' and 'maybe'. The final part featured an open-ended 'any comments' section where general views were sought from participants. As the questionnaires were administered to general citizens of diverse backgrounds, the questions were drafted in such a way that they conveyed the urban sustainability concept into a language that non-academics and experts could understand. Consistent with its quantitative foundations, the questionnaires were generally designed to ensure reliability, objectivity, and generalisability (see Mathers et al. 2007). As such, the results are intended to be replicable

irrespective of the person conducting the research. In effect, as Groves (1989, p.358) argues, the *"goal is nothing less than the elimination of the interviewer as a source of measurement error"*. As face-to-face surveys require special skills in order to achieve consistency and robust insights into complex issues, the researcher took a course in 'research methods: surveys and questionnaires' as part of the researcher development programme in Bournemouth University. This ensured that the researcher honed his skills in effectively collecting, preparing, and analysing survey data. This was complemented by engagement with literature on face-to-face survey strategies and mock role-play of questionnaire administrations. Overall, the questionnaires administered were intended to provide a level of validation to the information gathered from literature and other methods employed. A sample of the questionnaire is attached in Appendix 2.

3.5.3.4.2 Participant selection.

A stratified random sampling method was adopted to select survey participants which involved drawing a random sample based on particular characteristics (Teddlie and Yu 2007). Survey participants were selected in a way such that the broad range of densities / classes were represented. In selecting participants in Kumasi, participants were approached from at least one suburb in each of the nine sub-metropolitan assemblies (at the time of the study) which made certain that low, middle, and high-income areas were covered. Unlike in Kumasi, Obuasi's population size means that it has no sub-municipals, but the municipality is rather organised around suburbs / towns. Based on local knowledge and ground observation, questionnaires were administered in mining quarters and estates to represent high-income areas, while every other location in the municipality was marked as low- / middle-income. Responses were elicited from both long-term residents and new residents who were aged 18 or older, although a minimum threshold of two years residence was used in order to ensure respondents were adequately familiar with a respective urban area. In all, questionnaires were administered in the closest six suburbs or towns from the centre. In administering the questionnaires, the researcher and an assistant (with no technical input), on reaching a survey community, explained the research and sought permission from a local representative to conduct the survey. Generally, the researcher sought to target every other household located in the main streets of suburbs. A total number of 624 questionnaires were administered, and the breakdown is presented in Table 3.8. The response rate was 100% because the survey only proceeded with the consent of the respondents. However, four of the questionnaires were invalid as they had missing values. Out of the 624 participants to whom the

questionnaires were administered, 15 of them (9 in Kumasi and 6 in Obuasi) provided comments which were considered relevant for discussion on the general perception of citizens based on the subject matter being surveyed. These comments are attached in Appendix 3.

Table 3.8: Breakdown of questionnaires administered.

Location	**Total number administered**	**Invalid Questionnaires**
Kumasi	321	3
Obuasi	303	1

3.5.3.4.3 Analysis of survey data.

As the survey data were taken in paper form, the results were subsequently transferred manually and organised in Microsoft Excel software. This was followed by processing in IBM SPSS (version 20.0) software where statistical analysis was performed. In addition to frequency tables and bar charts used to present the survey data, the SPSS software was used to analyse group difference in perceptions of citizens. These were tested using non-parametric statistical tests. The differences in perceptions of respondents based on variables including age, education level, gender, and economic status were tested using the Mann-Whitney U test for two independent samples and the Kruskal-Wallis H test for more than two independent samples respectively. Only statements whose responses fulfilled key assumptions for the respective tests were selected for analysis. In terms of assumptions, for both tests, the groups being examined must be independent and the dependent variable should be continuous (Statistics Solutions 2019; University of Sheffield 2019). Consequently, the group differences in the survey responses were determined based on the following hypotheses.

(a) Gender differences in citizens perceptions of sustainability statements.

The decisions on statistical tests for gender differences were based on the following hypothesis.

(i) H_o: There is no statistical evidence of interaction between gender and the responses to a selected statement.

(ii) H_1: There is statistical evidence of interaction between gender and the responses to a selected statement.

(b) Differences in perception due to economic (employment) status.

The decisions on statistical tests for economic status differences were based on the following hypothesis.

(i) H_o: There is no statistical evidence of interaction between economic status and the responses to a selected statement.

(ii) H_1: There is statistical evidence of interaction between economic status and the responses to a selected statement.

(c) Differences in perceptions due to age.

The decisions on statistical tests for differences in perceptions due to age were based on the following hypothesis.

(i) H_o: There is no statistical evidence of interaction between age and the responses to a selected statement.

(ii) H_1: There is statistical evidence of interaction between age and the responses to a selected statement.

(d) Differences in perceptions due to level of education.

The decisions on statistical tests for differences in perceptions due to level of education were based on the following hypothesis.

(i) H_o: There is no statistical evidence of interaction between level of education and the responses to a selected statement.

(ii) H_1: There is statistical evidence of interaction between level of education and the responses to a selected statement.

3.5.4 Methods for Objective Four.

Objective Four aims to examine the sustainability construct and operationalisation in Ghana's urban policies in order to determine their consistency with the principles of sustainable development. This research adopted Davidson and Arman's (2014) analytical approach for assessing municipal strategies and urban policies in Australia, in order to capture the dominant understanding of urban sustainability in selected sustainability-related public

policies and clarify their current positions in terms of sustainability constructs and operationalisation. Unlike David and Arman (2014) who assessed the sustainability constructs using an evaluation matrix that was based on UN-Habitat's eight emerging trends of urban sustainability, this study, as inspired by Goal 11 of the Sustainable Development Goals (SDGs) to **"***make cities and human settlements inclusive, safe, resilient and sustainable"* (United Nations 2015, para. 1), used an evaluation matrix based on sub-dimensions of the City Prosperity Index (CPI) launched by the UN-Habitat in 2012 to measure sustainability and prosperity in urban areas (UN-Habitat 2016b). The choice of CPI over the UN-Habitat's emerging trends is based on the reality that the CPI is more comprehensive in terms of the pointers to sustainability, and it is intended to be an updated package for measuring urban sustainability. Thus, an evaluation matrix based on the sub-dimensions of the CPI was used to assess urban-related policies and the number of ticks assigned is explained as follows. Zero ticks imply an absolute lack of coverage of the sub-dimension reviewed. One tick was assigned when a sub-dimension has been highlighted but there is a lack of detailed discussion or associated implementation process. Two ticks were assigned when there is a detailed or associated implementation process captured in the document reviewed. The selected documents were the National Urban Policy (NUP 2012) which has been formulated by the Government of Ghana in order to steer Ghana's urbanisation to sustainable outcomes; and the Action Plan (MLGRD 2013) which is ancillary to the NUP and contains specific initiatives to be carried out in order to achieve the goal of the NUP.

Furthermore, unlike David and Arman (2014) who critiqued their sustainability constructs through the lens of Urban Political Ecology, the centrality of urban sustainability in the present discussion of the interactions between urbanisation and sustainable development means that the research drew on the World Bank's (2018) Urban Sustainability Framework (USF) as the lens of analysis for discussions of how the sustainability construct is deployed in the policies reviewed. Centrally embedded within the USF is its measuring framework, which is the benchmark used in ascertaining the deployment of sustainability constructs in this PhD thesis. The primary aim advanced in the measuring framework of the USF is to improve how urban sustainability is understood, and to promote evidence-based integrated planning through six dimensions of sustainability. The six dimensions prescribed by the USF are categorised into enabling dimensions and outcome dimensions, as shown in Table 3.9 and Table 3.10.

Table 3.9: Enabling dimensions and associated goals.

Enabling Dimensions		**Goals**
1.	Governance and integrated planning	Achieve integrated well-planned urban development.
2	Fiscal sustainability	Ensure accountable governance and fiscal sustainability.

Source: World Bank (2018).

Table 3.10: Outcome dimensions and associated goals.

Outcome Dimensions		**Goals**
1	Urban economies	Attain sustainable economic growth, prosperity, and competitiveness across all parts of the city.
2	Natural environment and resources	Protect and conserve ecosystems and natural resources into perpetuity
3	Climate action and resilience	Work toward mitigating greenhouse gas emissions while fostering the overall resilience in cities.
4	Inclusivity and quality of life	Work toward creating inclusive cities and improving cities' liveability, focusing on reducing poverty levels and inequality throughout cities.

Source: World Bank (2018).

The following questions were also used as a framework for corollary discussions on the review of selected policy documents:

- To what degree is sustainability / sustainable development accentuated within the policy documents?
- Which factors affect the sustainability operationalisation of the policy documents?

3.5.5 Methods for Objective Five.

Objective Five aims to examine sustainable city development in Ghana through a sub-case-study. In order to analyse how a 'sustainable city' is being conceived and implemented in an SSA context, the 'Appolonia City' project (near Accra, Ghana's capital city), which was captured in the inventory of current 'sustainable city' developments in SSA presented in Section 2.3.3, was selected as a demonstrable exemplar. The location of Appolonia City, relative to the other case study sites, is shown in Figure 3.1. Literature was reviewed in order to give an overview of the Appolonia City project. An evaluation matrix was applied based on the sustainable urban form matrix for Jabareen's (2006) definition of an eco-city (shown in Table 3.11). Numerical values of 3, 2, and 1 were assigned for 'high', 'moderate' and 'low' rankings respectively. The definitions and assumed benefits of the factors that contribute to a sustainable urban form have already been presented in Table 2.1. Data for this sub-case-study, including project statistics and images, were acquired from the website of the developers of Appolonia City.

Table 3.11: Sustainable urban form matrix for an eco-city.

Factor	**Jabareen's definition**
Mixed land use	Moderate (2)
Diversity	Moderate (2)
Sustainable transport	High (3)
Sustainable energy	High (3)
Compactness	Low (1)
Greening	High (3)
Density	Moderate (2)

Source: Jabareen (2006).

3.5.6 Methods for Objective Six.

Objective Six aims to propose a conceptual model that could facilitate decision-making for the transition to urban sustainability in Ghana, and by extension, SSA. To achieve this, the findings and discussions were consolidated and the components of the DPSIR conceptual framework (applied to organise knowledge on the interactions between sustainable

development and urbanisation) was modified. In so doing, the modified model produced an adaptive 'response' component based on the study findings which could facilitate decision-making for urban sustainability transition in Ghana.

Chapter Four

4. Urbanisation and sustainable development in Ghana: a critical analysis

4.1 Introduction

This chapter is an overarching case study that provides a critical analysis of sustainable development and urbanisation in Ghana. Without prescribing and providing appropriate solutions to the challenges of contemporary urbanisation, the sustainable development of Ghana's urban areas will remain a challenge. Thus, the broader objective of undertaking a critical analysis of urbanisation and sustainable development in Ghana is to frame a national perspective that will provide the building blocks upon which every nuance of the interaction between the two phenomena at the local urban level (presented in Chapter Five) could be captured and expressed. In terms of past, present, and future sustainable development and urbanisation in Ghana, key questions emerge which will guide the present discussion. In the context of this thesis: What are the existing urban challenges in Ghana? What are the key factors that influence urban development in Ghana? What is the overall development situation in Ghana in the context of the principles of sustainable development? What are the characteristics and outcomes of Ghana's urbanisation process? What are the independent or mediating factors that shape the urbanisation process? What are the wider implications of urbanisation for sustainability in Ghana?

Following this introductory section, the remainder of this chapter proceeds in three sections. The first section provides an overview of urban challenges, as well as selected key factors that influence urban development in Ghana. The second section provides an assessment of the sustainable development situation in Ghana. The third section provides an analysis of urbanisation in Ghana and discusses the implications of the country's urbanisation for sustainable development. This chapter does not attempt an empirical analysis of the extent to which the various dimensions of sustainability are affected by the urbanisation as the complexity of both processes makes it challenging to assess individual strands in isolation. Rather, for this study, this chapter presents an overall perspective on the sustainability implications of urbanisation in Ghana. This chapter, therefore, does not exhaust all the details of urbanisation and sustainable development in Ghana. Nevertheless, it captures relevant

information on the two phenomena based on available data and situates them within the wider context of this thesis.

4.2 Review of urban challenges and key factors that mediate urban development in Ghana

4.2.1 Urban challenges.

Duranton (2014, p.3) maintains that a key challenge to poor and developing nations *"is to ensure that their urban systems act as drivers of economic growth"* rather than act as a break. Like many other developing countries, the dualistic nature of urbanisation in Ghana presents opportunities as well as challenges. Using health as an example, the concentration of health facilities in urban areas could be an advantage of urbanisation (Vlahov et al. 2005), while rapid urbanisation could also create challenges of inequality in health access in urban areas (Matthews et al. 2010). While challenges may typically differ from one urban centre to another due to factors which include, but are not limited to, population size, geography, and human development, some common challenges can still be identified. At an annual growth rate of 3.4%, rapid urbanisation in Ghana has complicated the government's capacity to provide essential infrastructural and social services (Farvacque-Vitkovic et al. 2008; Okeke 2014). Essentially, Yeboah and Obeng-Odoom (2010) have argued that the urbanisation process has outpaced planning provisions in Ghana. The following sub-sections will, therefore, give an overview of some of the significant challenges confronting urban dwellers and managers in Ghana.

4.2.1.1 Environmental degradation.

The inevitable force of urbanisation has direct and indirect ecological implications for cities (Baabou et al. 2017). In Ghanaian urban areas, the impacts of urbanisation and urban growth on the environment are manifold. Like other cities in SSA, urbanisation has resulted in increased vehicular ownership, increased use of fuel for cooking, poor waste management practices, industrial emissions, and dust from unpaved roads (Amegah and Agyei-Mensah 2017). For example, scholars have observed a worsening level of air quality as cities in the country are known to have very high levels of particulate matter (Dionisio et al. 2010). Dionisio et al. (2010) have estimated annual particulate matter ($PM_{2.5}$) levels in Accra (Ghana's capital city) to range from 39 to 53 $\mu g/m^3$ at roadside sites and 30 to 70 $\mu g/m^3$ at

residential sites. This estimation means that particulate matter ($PM_{2.5}$) levels in Accra are higher than the levels recorded in the cities of Europe and America, which are less than 20 $\mu g/m^3$ (Brauer et al. 2012). Air pollution (through increasing particulate matter) has far-reaching implications for the overall well-being of the urban population in Ghana, as urban air pollution has been linked to increased incidence of cardiovascular, respiratory and lung diseases in SSA cities (Dalal et al. 2011; WHO 2013). The literature shows that urbanisation and associated urban growth in Ghana are taking place in an undirected manner, which have implications for the sustainable use of environmental resources in urban areas and towns (Yankson and Vough 1999; NUP 2012). Increasing affluence in cities tends to alter consumption patterns and affects resource use (Myers and Kent 2003). A study by Mantey and Sakyi (2019) has shown that high-income urban residents in the city of Accra produced high GHG emissions. They further noted that high-income residents who were aware of climate change produced higher GHG emissions compared with those who were not aware (Mantey and Sakyi 2019). Furthermore, in an era of climate change, there is an increasing vulnerability of Ghana's urban citizens to environmental hazards. For example, the country has experienced a frequent occurrence of natural disasters, including floods and droughts over the years (Okyere et al. 2012). In Accra, where there is annual flooding, the situation is further exacerbated by issues such as weak planning regimes and inadequate disaster response capacities, making the urban poor who live in densely populated slums vulnerable (Okyere et al. 2012). In a nutshell, the pace of Ghana's urbanisation exerts pressure on available environmental resources and hampers the ability to respond to environmental hazards in urban areas.

4.2.1.2 Unemployment and informality.

The population of Ghanaians living in 'urban areas' officially exceeded those in rural areas in 2010 (Ghana Statistical Service 2014a; Cobinnah et al. 2015a). The country's urban labour market is fundamental to the subsistence of urban dwellers as it transmits economic growth to workers and their dependents. A burgeoning urban population in a less-developed country such as Ghana means that the demand for jobs exceeds what is available, making urban unemployment widespread (Frank 1968). The negative impacts of urban unemployment are particularly strong for vulnerable groups such as children, youth, elderly, disabled, and the low-income population (OECD 2013). To put the above assertion in perspective, a study in Britain by Bell and Blanchflower (2010) estimated that the cost of being unemployed for six

months at the age of 22 translates to about 8% wage reduction at the age 23. Thus, for the youth aged between 15-24, who constitute about 20% of Ghana's population, and who are 'not in education, employment or training', unemployment presents a potentially harmful effect on their future well-being (OECD 2013).

As is observed in other developing countries, most migrants who move from rural to urban areas end up in the informal sector due to various reasons including a lack of social network (Ofori 2009; Osei-Boateng and Ampratwum 2011). The dominance of the informal sector in Ghana is attributed to reasons which include, but are not limited to, public sector employment freezes and the effects of globalisation, thereby resulting in local private sector firms folding up due to competition from foreign firms (Osei-Boateng and Ampratwum 2011). For urban areas, the precarious employment situation, together with an increasing urban population results in an inadequate supply of formal jobs (Ofori 2009; Osei-Boateng and Ampratwum 2011). The contribution of informality to the employment situation in urban Ghana is significant as the informal sector is estimated to constitute about 80% of Ghana's total labour force (Hormeku 1998; Osei-Boateng and Ampratwum 2011). Also, while Fajnzylber et al. (2006) have argued that small-scale self-employment is often an outcome of choice rather than the lack of formal employment opportunities, the same cannot be said of Ghana, where like other developing countries, unskilled and uneducated citizens abound (Falco et al. 2011). Gillespie (2016) has conducted empirical research related to the struggles over urban space in Ghana's capital city, Accra, and his observation of a large 'informal proletariat' kept out of formal waged employment and housing provision succinctly captures the challenge of informality in urban Ghana. Academic explanations given to urban informality in Ghana have mainly centred on the dispossession of the urban poor of their lands, which in most cases, were a source of livelihood and shelter (Obeng-Odoom 2013a). Informality has profound implications on wage determination and income equality as it is generally associated with low wages compared to formal employment (Bargain and Kwenda 2011; Angel-Urdinola and Tanabe 2012).

4.2.1.3 Poverty and inequality.

A lot has changed since the turn of the millennium as the country has experienced sustained economic growth (World Bank 2015). The overall incidence of poverty in Ghana has reduced substantially, and the country has achieved its MDG target of halving the proportion of the

population living in poverty. Statistical evidence shows that poverty levels had reduced from about 56% in the 1990s to about 24% in 2013. Nevertheless, rapid urbanisation and population growth have resulted in the proportion of urban-poor increasing over time. For example, although the poverty rate in Accra reduced from 23% in 1992 to about 4% in 1999, it increased again to 11% by 2006 (UNICEF 2012). Available evidence also suggests that inequality has increased at the national level as economic gains have not been evenly distributed (World Bank 2015; Cooke et al. 2016). The country's Gini coefficient rose from 37% in 1992 to 42.3% by 2013 (Cooke et al. 2016). Also, by 2006, the wealthiest 20% of the population earned over half of Ghana's income, up from about 44% of national income in the 1990s; the poorest fifth saw their share of national income reduce from 6.9% to 5.2% within the same period (Cooke et al. 2016). From a gender perspective, the literature (for example, Awumbila 2006; Danquah and Ohemeng 2017) suggests that urban poverty is sometimes determined by gender and may be shaped by cultural factors such as social status assigned to men and women, as the level of poverty experienced by women in Ghana's urban regions tends to be more severe than men. The widening inequality in Ghana is inimical to economic development and poverty reduction (Obeng-Odoom 2012). In terms of health, Wilkinson and Pickett (2009) have established a relationship between high inequality and high social and health problems in their study, and they suggest that the former causes the latter. Moreover, they suggest that a country will be better positioned to safeguard the basic needs of its citizens through a reduction in inequality, which will, in turn, reduce socio-economic (health and social) problems. Subsequently, as admitted by the Ghana Statistical Service (2007, p.17), *"the decline in poverty [was] offset by increasing inequality"*. These observations have implications for the overall well-being of the country's citizens (for example see Easterly 2007), especially in urban areas where most of the population is now concentrated.

4.2.1.4 Housing.

A fundamental issue faced by urban areas, as the unabated process of urbanisation continues, is housing. As a basic necessity of life, housing is seen as crucial to human well-being across all spatial levels (Adoeye 2016), a provision Turok (2016) notes will shape the dynamics of society and help to determine whether successive generations are in better situations than their predecessors. Turok (2016) makes a case for access to better urban housing, which he believes has the potential to support two related objectives. He argues that access to durable and affordable urban housing will provide alternative means of sustainably managing urban

poverty as it creates conducive and liveable conditions through which citizens can acquire relevant skills. He further highlights how access to decent housing has the potential to raise urban productivity and output, through the expansion of economic and social opportunities in well-functioning cities.

As in many other countries in SSA, provision of housing, especially for the urban-poor, is a great challenge. The housing deficit in Ghana has been recorded at over 1.7 million (Daily Graphic Online 2018). Ghana's urban housing predicament is summed up by Yakubu et al. (2014), who have observed that the housing situation in most Ghanaian cities is characterised by supply difficulties, deteriorating conditions, and overcrowding. Their study highlighted the inter-linkages between poor housing conditions, health, and poverty in cities, further arguing that the plights of the urban-poor are exacerbated by a lack of access to public goods and services due to an exclusion created by the limited coverage of the urban-poor under State planning. In a study to determine the affordability of housing in two Ghanaian cities (Kumasi and Tamale), Boamah (2010) highlighted the generally worsening conditions of housing. Furthermore, a study by Konadu-Agyeman (2001) that examined the relationship between population growth and housing conditions in Accra between the 1950s and 1990s showed a general deterioration of housing conditions in the 1990s as compared with the 1950s. A situation he argued, was made worse by a poor maintenance regime, a struggling economy, and poor rent control.

4.2.1.5 Transport

The role of the transport sector in the sustainable functioning of cities has been well-recognised (see Dalkmann and Sakamoto 2011; Birago et al. 2017). Urban transport serves as a vehicle through which many economic and social activities are carried out (Hidalgo and Huizenga 2013). The transport sector is estimated to account for 13% of global GHG emissions, as well as 23% of energy-related GHG emissions (UN-Habitat 2011 as cited in Cevero 2013). According to Dalkmann and Sakamoto (2011), the motorised nature of global transport, which is fundamentally based on fossil fuels, is not sustainable as it has far-reaching economic, social, and environmental effects. Subsequently, Hidalgo and Huizenga (2013, p.76) have argued that a paradigm shift is required in order to move the trajectory of urban transport onto a sustainable path by "*adopting policies to avoid long and unnecessary motorised travel, to shift the growth trends of individual motor travel to favour non-*

motorised and public transport, and to improve technology and operational management of transport activities". Godard (2013) has identified urban sprawl and fuel and energy costs as two critical factors that affect sustainable urban mobility in many African cities. He highlights the tension between urban sprawl and mobility as one that contradicts the criteria for sustainable mobility as it results in longer travel distances and increased energy consumption. He further points out that high energy costs can either coerce users and operators to make more energy-efficient choices or cause potential social tensions, as was the case in Nigeria in 2012 where there were strikes and riots due to fuel price increments.

The main forms of urban transport in Ghana are private vehicular transport, public transport, and other non-motorised transport (such as walking). The country's transport system and infrastructure have been characterised as poor, congested, and inadequate (Kwakye and Fouracre 1998; Amoh-Gyimah and Aidoo 2013). Increasing urbanisation and urban growth have, thus, exacerbated pressures on the already-stressed urban transport systems. For example, car ownership has increased tremendously, which is reflected by the number of newly registered cars (Obeng-Odoom 2009a), and this has profound effects on transport infrastructure and institutions. Although specific urban figures do not exist, about 94,846 cars were newly registered in 2009 compared to 52, 881 in the year 2000 (Ministry of Roads and Highways, Ministry of Transport, and Ghana Statistical Service [MRH, MoT and GSS] 2011). In a study which examined the mode of transport to work by government employees in Kumasi, Amoh-Gyimah and Aidoo (2013) observed a high level of traffic congestion in the metropolis especially during the extended peak periods when workers travel to work. Scholars have also noted the prevalence of road accidents, increase in travel times, and pollution as a result of urban growth and the resulting infrastructural bottlenecks in the urban transport system (Kwakye and Fouracre 1998; Amoh-Gyimah and Aidoo 2013). From the preceding observations, it can be argued that urban transport in Ghana is affected, and reflected by the extent of urbanisation. With urbanisation and urban growth expected to increase (Cobbinah and Niminga-Beka 2017), a key question is whether this fundamentally-stressed urban transport system can cope with the demographic shift in a sustainable manner, especially in a less-developed country such as Ghana, which is less endowed with the financial and human resources to deal with the transport problems of urbanisation. Although the country's urban road network tripled from 4064 km in 1985 to 12400 km in 2010 (Environmental Protection Agency [EPA] 2006; Government of Ghana [GOG] 2010), a lack of alternate forms of transport, such as rail transport, coupled with weak transport

management (Obeng-Odoom 2009a), means that current transport provision is unlikely to match the evolution of transport needs of Ghana's urban residents. The mutually interactive nature of transport with other parts of the urban system reflects the need to further explore the dynamics between urban development and urban transport, especially where respective policies strongly affect each other.

4.2.2 Selected key factors that influence urban development in Ghana.

4.2.2.1 Politics.

As much as urbanisation and urban sustainable development in Ghana are shaped by factors including migration, natural population growth, land use, market forces, globalisation etc., the urbanisation and sustainable development processes in the country are inherently political. As a result, the interactions between urbanisation and (sustainable) development in Ghana have evolved through key political shifts at the national level which have, in turn, shaped outcomes at the local urban level (Obeng-Odoom 2009a; Fuseini and Kemp 2015). For example, urbanisation and its attendant development in Ghana have been shaped by the agenda of the ruling regime since: (i) the pre-independence era where the interests of the British colonial government determined urban development and; (ii) the post-independence era (after 1957) where urban development has been shaped by mass industrialisation due to the socialist ideologies promoted by Kwame Nkrumah (Ghana's first president), as well as the neo-liberal structural adjustment programmes of the 1980s, etc. Post-independence, a relatively young independent Ghana pursued an extensive State-led industrialisation programme under the leadership of President Kwame Nkrumah. This kick-started a mass rural exodus to urban areas in order to take advantage of new economic opportunities. The adoption of 'growth pole' strategies by various regional authorities in the 1970s led to increased urbanisation in urban centres like Ho, Cape Coast, and Tamale as many people moved from all over the country to take advantage of the ventures established (Yaro et al. 2011). The programmes under the growth pole strategies were essentially economic ones and were not considered as interventions for urban development and urbanisation. Nonetheless, the impact of the programmes under the growth pole strategies on the above-mentioned urban areas cannot be understated as they helped to transform those areas into prominent urban centres with better facilities and infrastructure necessary for development. Growth in urbanisation rates in Ghana from 1980 was spurred by the structural adjustment programmes (SAPs) prescribed by the International Monetary Fund (IMF) to support the country's

economic recovery in the aftermath of the global oil crisis in the 1970s. This period began the mainstreaming of neo-liberal ethos in Ghanaian policy framework which has resulted in increased private sector participation, as well as an extension of the markets and minimised direct State provision (Obeng-Odoom 2012).

Furthermore, the Fourth Republic of Ghana (1992- present) has been dominated by politics between the two most dominant political parties; the National Democratic Congress (NDC) and the New Patriotic Party (NPP). Considering how the politics of the Fourth Republic affect urbanisation and development, a review of Ghana's 2008 Election manifestos showed the convergence, inadequacies, and tensions in the proposals proffered by the political parties towards the management of the country's urban transition (see Obeng-Odoom 2009b). For example, in terms of urban regeneration, there was a convergence in thinking about how the prevailing weak urban planning regime undermined the aesthetic quality of the built environment in Ghana's urban areas. To address the urban planning dilemma in the context of urban regeneration, the NPP proposed to reduce illegal building structures by strictly enforcing urban planning regulations, as well as by providing resources for the acquisition of mapping and photography equipment that would enable the enforcement of building codes (NPP 2008; Obeng-Odoom 2009b). The NDC proposed to tackle illegal building and builders, as well as improve sanitation, by preventing and improving slums (NDC 2008; Obeng-Odoom 2009b). The NDC further proposed to enhance urban regeneration by pursuing the expansion of water infrastructure. Despite the convergence in thinking between the NDC and NPP in the context of urban regeneration which has been demonstrated above, the potential inadequacies in the proposals proffered by both parties are evident. In this context, while the propositions by the NPP and NDC could potentially contribute to urban regeneration in Ghana, it is worth noting that urban regeneration is not limited only to improving the aesthetics of the built environment and providing water infrastructure, but rather encompasses addressing the economic and social well-being issues of urban communities by providing avenues for socio-economic growth and employment (Syms 2002; Gruneburg 2006). Furthermore, both the NPP and NDC proposed to solve urban transport problems in Ghana by promoting mass transit infrastructure. Tensions emerge, however, as the NDC appeared to favour public provision of transport services and at the same time proposed to support private transport operators to be more effective, efficient, and competitive (NDC 2008; Obeng-Odoom 2009b).

4.2.2.2 Land tenure.

Land plays a strategic, yet complex, role in development. In simple terms, land tenure describes the set of procedures that determine how access is granted for the use, control, and transfer of land in a jurisdiction. According to Owoo and Boakye-Yiadom (2015), the livelihoods of many people in less-developed countries fundamentally depend on access to land. This assertion especially holds in places such as Africa where many people engage in subsistence farming, thereby making land tenure security crucial for meeting the development needs of people (Lemmen 2010). For the poor, a lack of access to land resources potentially represents an existential threat as the capacity of poor people to participate in, and exploit social, economic, and civic opportunities tends to be undermined. In the context of urbanisation, land tenure and access are critical, as population growth due to urbanisation creates demand for more land to accommodate expanding urban functions. In some cases, demand for land tends to outpace supply within a specific urban boundary, thereby affecting surrounding areas.

In Ghana, where customary land tenure predominates, traditional leaders assume ownership of land for and on behalf of communities (Aubynn 2006; Kalt 2019). In specific terms, about 80% of land is held under customary ownership, while the rest is primarily owned by the State (Aubynn 2006; Tsikata and Yaro 2011). With the permission of the owner, land in Ghana may be rented or leased over a period of time (e.g., months, years) for various purposes including agriculture and housing (Nyame and Blocher 2010). This means that outright ownership of land in Ghana is limited. Therefore, the land and development needs of most Ghanaians are, sometimes, schematically influenced by the interests of land owners and other stakeholders such as the government, multi-national companies (MNCs), etc. In Ghana's mining regions, Nyame and Blocher (2010) suggest that with the decreasing value of agricultural land-use due to factors such as unpredictable income, climate stresses, etc., landowners appear to perceive mining leases as more economically-viable options. As a result, the livelihoods of some citizens (especially farmers) in the mining areas of Ghana are possibly threatened as land owners gravitate towards leases for small-scale mining activities. Even in areas where large-scale mining activities conducted by MNCs exist, the land-use interests of general citizenry tend to be subservient to those of MNCs whose interests are usually protected by the central government. Therefore, in most cases, citizens in communities are rendered landless, as land is annexed for large-scale mining operations through the application of legal instruments, because of the mutual economic benefits both

the MNCs (e.g., profits) and the government (e.g., taxes and royalties) are likely to accrue. For example, in the development of Newmont Ghana's Ahafo gold mine, over 9,000 people (mostly farmers) were displaced from their lands (Jnr et al. 2016). While compensation is sometimes paid to communities, and MNCs usually undertake corporate social responsibility (CSR) projects to maintain their social licence to operate, these might be insignificant when the livelihoods and long-term development needs of communities are considered.

4.2.2.3 Spatial and urban planning.

Historically, the extractive and agricultural sectors provided the basis for the uptake of spatial planning practice in Ghana as mining and cocoa investments created the need for Ghana's British colonial masters in the pre-independence era to make spatial planning provisions. As a result, Guggisberg's ten-year development plan (1920-1930) was launched in 1920 as the pioneering development plan that attempted to ensure orderly, safe, healthy, and socio-economically prosperous settlements in pre-independent Ghana (Leith 1974; Fuseini and Kemp 2015). Guggisberg's plan provided the foundation for the emergence of Ghana's first comprehensive spatial planning framework referred to as the Town and Country Planning Ordinance of 1945 (i.e CAP 84). The CAP 84 was Ghana's version of Britain's post-war restructuring of the country's planning provisions that had been extended to its colonies. Nevertheless, the geographical extent of planning in the pre-independence era was limited as planning provision mainly occurred within the boundaries of the 'Golden Triangle' (the vertices of the 'Golden Triangle' consisted of Kumasi, Accra, and Takoradi) where the bulk of exploitable resources that were of interest to the colonialists were confined (Adarkwah 2012).

The immediate post-independence planning regime aligned with the mass industrialisation strategy of that era and expanded planning beyond the 'Golden Triangle' to other parts of Ghana (The New York Times 1964). As a result, planning education was promoted, new planned townships were established, and institutional capacity was strengthened by establishing planning departments across the country (Inkoom 2009; Adarkwah 2012). However, it is worth noting that the three decades that followed Ghana's independence are known to have contributed to the urban challenges prevalent in Ghana today as planning capacity was overwhelmed by the urban population explosion (Fuseini and Kemp 2015). The assertion above is partly because the numerous coup d'états between 1966 (overthrow of first

post-independent government) and 1992 (when Ghana return to multi-party democracy) led to poor macro-economic performance and political instability. That situation undermined the stable politico-economic environment needed for planning to flourish (Fuseini and Kemp 2015). Following the liberalisation of Ghana's economy through the uptake of the IMF's SAPs which were designed to increase private sector investment and participation, as well as to promote decentralisation of governance (Obeng-Odoom, 2012; 2013b), the country's 1992 constitution provided the complementary legal and institutional framework for urban sustainable development in Ghana. Key legislations relevant to urban development were subsequently passed (see Fuseini and Kemp 2015) and these included: (i) the Local Government Act (Act 462 of 1993); (ii) the National Development Planning Commission (NDPC) Act (Act 480 of 1994) and; (iii) the National Development Planning System (NDPS) Act (Act 490 of 1994). In the years that followed, other key legislation and policies were introduced as Ghana became increasingly urban, including the National Urban Policy in 2012 (NUP 2012). In general, the legislations and policy highlighted above are among the key ones designed to enable planning institutions to respond to the opportunities and challenges of decentralisation, liberalisation, and rising urbanisation in the last three decades.

Critically, despite the various measures, including the legislations and policies highlighted above, that have been implemented to improve urban governance and management, urban planning in present day Ghana is dominated by a top-down decision-making process just as it was in the pre-independence era where planning in Ghana was top-down and Eurocentric (Adarkwa 2012), compared to the strong bottom-up that is common in developed nations. As a result, the most important decision-making on urban planning is controlled by central government agencies, with marginal inputs from authorities at the local urban level. The above scenario is explicitly captured by Obeng-Odoom (2009a, p.51) who wrote that: *"Tetteh's analysis (p. 22–30) of the 'role of Architecture and Planning' in the Future of Our Cities was very insightful. He argues that central government takes the responsibility of planning the cities while city authorities are tasked with controlling the development they did not plan for".*

4.2.2.4 How politics and land tenure affect urban planning and development.

It could be argued that politics contributes significantly to how planning processes and institutions have been undermined in Ghana. For example, as will be highlighted later in

Chapter Six with regards to the specific case of Ghana's National Urban Policy, a change in government could potentially undermine how the policy is implemented, and whether the contents of the policy align with the political ideologies of a new government. Furthermore, although legislations such as the Local Government Act (Act 462 of 1993) have been designed to enhance effective decentralisation by establishing Metropolitan, Municipal, and District Assemblies (MMDAs) which have oversight control of planning processes in respective jurisdictions, and whereas the NDPC ACT (ACT 480 of 1994) mandates the NDPC to ensure that local-level planning aligns with the broader national development plans and policies, local-level urban planning is effectively compromised through political patronage (Owusu 2004). The political patronage of local urban planning is attributable to the situation where the ruling government routinely appoints the leadership of both the MMDAs and the NDPC. The implications of political patronage at the local urban level in Ghana has been succinctly captured in published literature that surveyed the views of planners as follows: *"the politician is only motivated by the desire to win or retain power which is a matter of vote. A nicely planned neighbourhood does not vote but people who live in unapproved developments do. There is no chance for any [planning] proposal succeeding if our political leaders think it has the potential to affect their electoral fortunes"* (Yeboah and Obeng-Odoom 2010, p.87). Therefore, it is evident that eradicating undue political interference in urban planning processes in Ghana is critical for urban sustainable development.

Furthermore, published research alludes to how land tenure (discussed earlier), especially customary ownership, influences land use and urban planning decisions, and by extension, urbanisation and urban development in Ghana (Boamah et al. 2012; Ahmed and Dinye 2012; Siiba et al. 2018). Essentially, Siiba et al. (2018) argue that the land tenure system in Ghana has made it possible for traditional leaders, who are the key persons in customary ownership, to usurp formal planning institutions in the areas of land use determination and management. This is because while national institutions provide plans and policies to guide urban development, it is the traditional leaders who lease and allocate land within the respective jurisdictions. Where this dominance by traditional leaders (in terms of land allocation) is unregulated, as is mostly the case, they tend to assume the role of planning institutions, and, together with their surveyors, make land use decisions that may not align with the core values of urban planning. It is, however, interesting to note that the suggested interferences on land use and urban planning-related issues, mostly by customary land owners, are sometimes

embraced by a wider section of the Ghanaian society due to reported corruption and bureaucracies encountered when engaging formal planning institutions. This is not surprising as the literature (for example, Boamah et al. 2012; Ahmed and Dinye 2012), shows that defiance of Ghana's statutory land use plans instead of adherence by developers is common. This does not suggest that customary land ownership is the cause of the urbanisation and land use challenges in Ghana, but it demonstrates the key role it plays in (un)sustainable urban development in Ghana. In all, it is evident that land tenure and access, perceived or factual, are critical in the context of SD and urbanisation, especially in cases where people need to sustain their livelihoods or establish themselves as citizens in urban areas.

4.3 Sustainable development in Ghana

4.3.1 An overview of progress towards sustainable development in Ghana.

According to UNECA (2012a; 2012b), achieving SD requires a broad-based quality economic growth for which the prerequisite fundamentals include, but are not limited to, poverty and inequality reduction, as well as sound socio-economic infrastructure. Like most developing SSA countries, Ghana has taken important steps towards achieving SD. A plethora of developmental plans, policies, and initiatives have been formulated and implemented at national, regional, and local government levels in order to help guide the SD process and address its challenges (Alliance for Development 2014) which include:

(a) Ghana Shared Growth and Development Agenda.
(b) Sustainable Development Action Plan.
(c) Growth and Poverty Reduction Strategy, I and II.
(d) National Social Protection Strategy.
(e) National Environmental Sanitation Strategy and Action Plan.
(f) National Policy Framework on Climate Change.
(g) Ghana Education Strategic Plan (2003 - 2015; 2010 - 2020).
(h) Food and Agricultural Sector Development Plan, I and II.
(i) Medium Term Agricultural Investment Plan.
(j) Forestry Investment Plan.

For example, the government implemented a two-phased Ghana Poverty Reduction Strategy (GPRS I and II) aimed at reducing absolute poverty. A UNICEF-sponsored report in 2016

showed that the country's level of poverty fell from 56.5% to 24.2% between 1992 and 2013, helping it to achieve MDG target 1 of halving the proportion of the population living in absolute poverty (Cooke et al. 2016). However, by 2006, the annual average rate of poverty reduction had slowed by 1.1 percentage points, down from 1.8 percentage points in the 1990s. This shows that despite the successes in poverty reduction, the level of poverty is still significant; a situation Domfeh et al. (2012) argue challenges the country's SD progress as it affects nutrition, housing conditions, access to health, and education, etc. The National Environmental Sanitation Strategy and Action Plan (NESSAP) provided the policy framework for Ghana's environmental sanitation and helped provide access to improved water sources for the country's citizens. Nevertheless, an estimated 4,000 children still die annually from diarrhoea, and 23% of children in the country are affected by malnutrition linked to water and sanitation (UNICEF 2016). Another important area where Ghana has sought to promote SD has been through education. The role of education in promoting sustainable development is expressly captured by the various United Nations initiatives such as Education for Sustainable Development (ESD) and the Decade of Education for Sustainable Development (DESD) which sought to promote education and learning as fundamental for a more sustainable world (Pigozzi 2007). Some of the significant policies include the Free Compulsory Universal Basic Education (FCUBE) policy introduced in 1995 (Acheampong 2009) and the Free Senior High School Policy introduced in 2017 (Arthur-Mensah and Alagaraja 2018). These policies stress the relevance of education to the SD journey of Ghana and recognise how the unique challenge of poverty undermines the achievement of universal education as, for example, most parents were unable to afford the cost of education (Alderman and Brundy 2011). In demonstrating the importance of education to augment the production possibilities of citizens in driving social and economic development, Sen (1999, p.295) has argued that *"a person may benefit from education through reading, communicating, arguing, in being able to choose in a more informed way, in being taken more seriously by others and so on. The benefits of education, thus exceed its role as human capital"*.

Despite the efforts of the national government in promoting SD, the private sector plays a key role in Ghana. Springett (2013) describes the private sector (in this case, Multi-National Corporations [MNCs]) as an influential player that employs a market-based approach to control and shape the meaning of SD, and Chapter 30 of Agenda 21 outlined the roles of the private sector in realising SD (Van Alstine and Barkemeyer 2014). This paved the way for

the private sector to be seen as key stakeholders in finding solutions for developmental problems in developing countries rather than as opponents of development (Fox 2004). It also marked a shift in perceptions held about MNCs in the 1970s and 1980s when their agendas were seen to be in direct conflict with the developmental goals of developing countries (Hilson 2012). Using the case of MNCs in Ghana's mining industry as an example, they have implemented CSR programmes (in addition to paying royalties and taxes) aimed at contributing to the sustainable development of the communities in which they operate. Accordingly, IIED (2002, cited in Kemp 2009, p.202) has suggested that *"mining operations are sometimes the only viable option that remote communities have for social development"*. However, the role played by MNCs as partners in the quest for SD is one that could put the country's sustainable growth in the progeny of the free markets. This is because of the potential risks of MNCs to arrogate the environmental aspects of SD in a way that promotes economic growth and maximises profits. As Hilson (2012, p. 133) maintains, "*few industrial activities have as large an environmental footprint and are capable of wielding as much influence on the well-being of a society as a large-scale mine or oil and gas projec*t". While there is some evidence on Ghana's performance (for example, annual UN and national MDG reports) towards realising some of the SD-centred international agreements and goals (see, for example, UNDP 2015), empirical data on how well the country has performed are scarce. One could therefore question the extent to which both public and private efforts have been able to reconcile the country's economic, social and environmental ambitions in the context of SD.

4.3.2 An assessment of sustainable development in Ghana.

4.3.2.1 Human Development Index (HDI) for Ghana.

In Figure 4.1, Ghana's HDI score, which is a comprehensive measure of human well-being that incorporates key socio-economic dimensions of education, life expectancy, and income (Hicks 1997; Hou et al. 2015), is presented based on available data for the period 1990–2018. It is seen from Figure 4.1 that Ghana's HDI values increased from 0.454 in 1990 to 0.596 in 2018. This shows that overall, there has been an improvement in the level of development (as measured by the HDI). Table 4.1 also shows the disaggregated values for the components of Ghana's HDI for the period 1990–2018. From Table 4.1, it is seen that for an HDI value of 0.454 in 1990, life expectancy at birth was 56.8 years, expected years of schooling was 7.6 years, mean years of schooling was 4.9 years, and per capita gross national income was

U.S.$. 1,897. By 2018, the respective components had improved significantly as for an HDI value of 0.592; life expectancy was 63.8 years, expected years of schooling was 11.5 years, mean years of schooling was 7.2 years, and GNI per capita was U.S.$. 4,099.

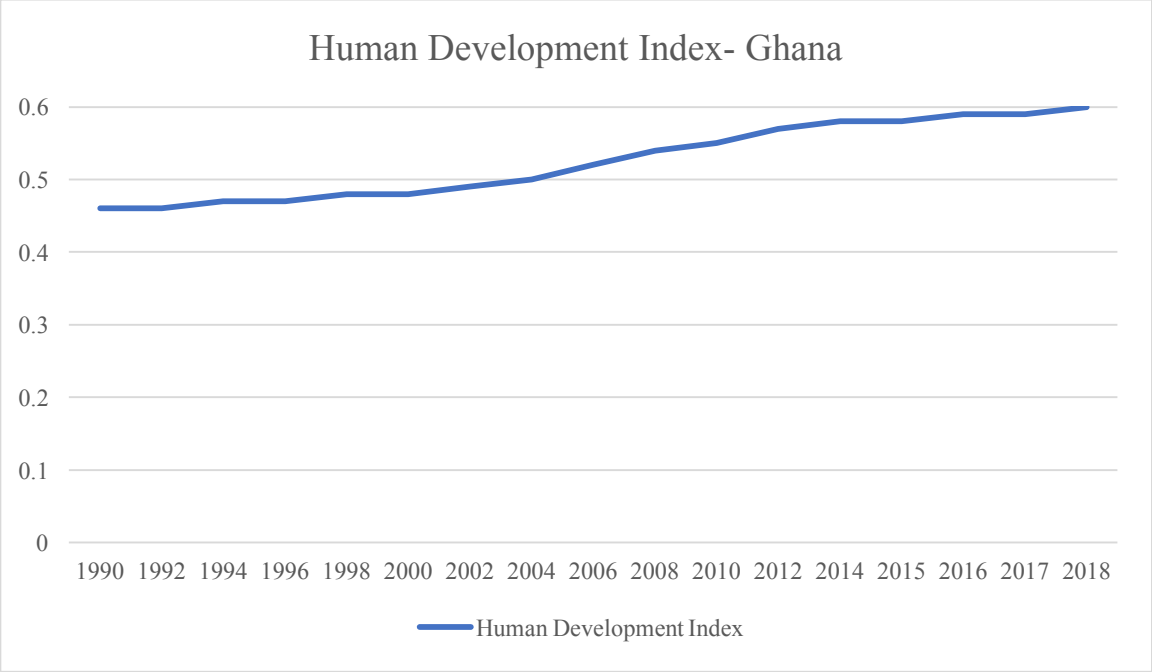

Figure 4.1: Human Development Index for Ghana, 1990-2018.

Source: UNDP (2018; 2019b).

Table 4.1: Component values of Ghana's HDI, 1990-2018.

Year	Life expectancy at birth	Expected years of schooling	Mean years of schooling	GNI per capita (2011 PP$)	HDI value
1990	56.8	7.6	4.9	1,863	0.454
1995	57.5	7.7	5.7	1,992	0.472
2000	57.0	8.0	6.1	2,152	0.483
2005	58.7	8.7	6.4	2,475	0.508
2010	61.0	10.9	6.7	2,977	0.554
2015	62.8	11.7	6.9	3,735	0.585
2016	63.1	11.6	7.1	3,756	0.587
2017	63.5	11.5	7.1	3,943	0.591
2018	63.8	11.5	7.2	4,099	0.596

Source: UNDP (2018; 2019b).

4.3.2.2 Inequality-Adjusted HDI (IHDI) for Ghana.

The inequality-adjusted HDI for Ghana for the year 2018 is presented in Table 4.2. The IDHI compensates for the inequality in the distribution of the components of the HDI by discounting the average value of each component based on its level of inequality. From Table 4.2, it is seen that when Ghana's HDI of 0.596 in 2018 (Table 4.1) is adjusted for inequality, it falls to 0.427. Specifically, inequality in the distribution of the HDI indices which includes inequality in life expectancy at birth (24.2%); inequality in education (34.9%); and inequality in income (25.3%) led to an overall loss of 28.3% in HDI value.

Table 4.2: Ghana's IDHI for 2018.

IDHI value	**Overall loss (%)**	**Human Inequality coefficient**	**Inequality in life expectancy at birth (%)**	**Inequality in education (%)**	**Inequality in income (%)**
0.427	28.3	28.1	24.2	34.9	25.3

Source: UNDP (2019b).

4.3.2.3 Ecological Footprint for Ghana.

In Figure 4.2, Ghana's ecological footprint score, which is a measure of the quantity of ecologically productive areas needed for the maintenance of human natural resource consumption and the assimilation of human waste, is presented based on available data for the period 1965–2016. It can be seen that the country's ecological footprint increased from 1.1 gha per capita in 1965 to 2.0 gha per capita in 2016. At the same time, its bio-capacity decreased from 2.60 gha per capita in 1965 to 1.3 gha per capita in 2016. It can be seen that in 1995, Ghana's ecological footprint equalled its bio-capacity, and by 2016, Ghana had a bio-capacity deficit of -0.7. Therefore, if one adheres to the threshold set by WCED (1987), then the ecological environment in Ghana, as used for the production of natural resources and assimilation of waste, appears to be on an unsustainable trajectory.

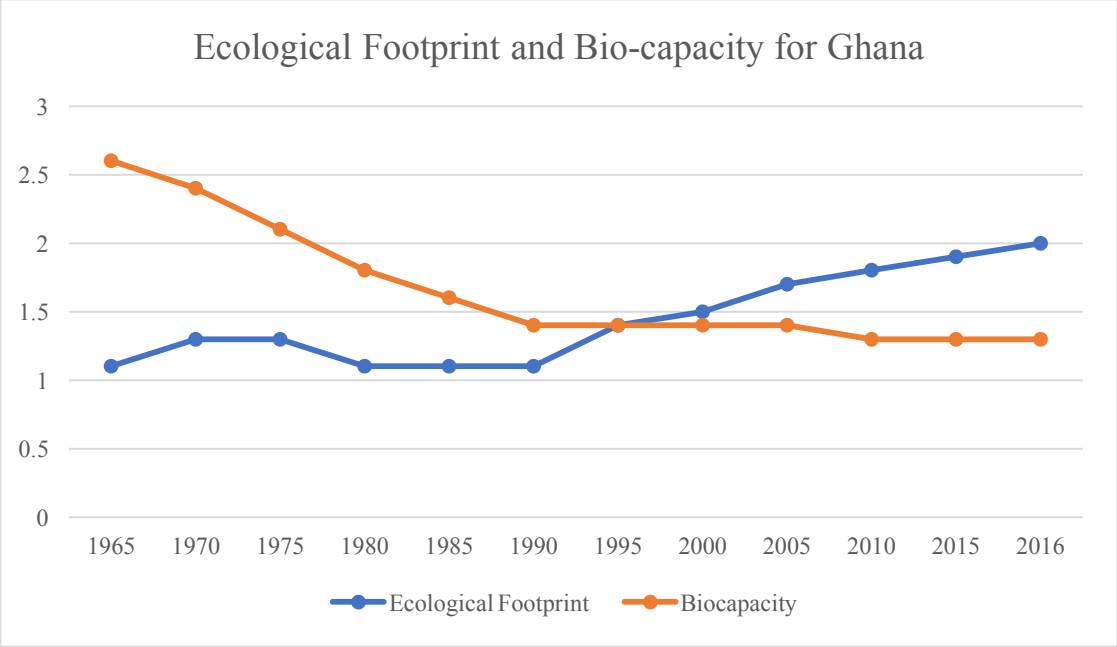

Figure 4.2: Ecological Footprint and Bio-capacity statistics for Ghana, 1965-2016.
Source: Global Footprint Network (2019).

4.3.2.4 Gini coefficient scores for Ghana.

In Figure 4.3, the Gini coefficient score, which measures the distribution of income, is presented for Ghana based on available data for the period 1987-2016. The values used to measure inequality based on the Gini coefficient are between 0 and 100, where 0 represents total equality. This means that the higher the value of the Gini Coefficient, the greater the level of inequality. Therefore, as Figure 4.3 shows, the inequality in Ghana has increased drastically from 35.3% in 1987 to 43.5% in 2016.

Figure 4.3: Ghana's Gini coefficient values, 1987-2016.
Source: World Bank (2019a).

4.3.2.5 Proportion of renewable energy in total primary energy in Ghana.

In Figure 4.4, the proportion of renewable energy (R.E.) in total primary energy production in Ghana based on available data is presented for the period 2005-2017. From this, it is seen that the proportion of R.E. has decreased gradually from 41.7% in 2005 to 29.4% in 2017. Published data, however, shows that reduction in R.E is due to the exponential increase in the use of non-renewable energy such as oil (fossil fuel), rather than a drastic decrease in R.E. sources such as hydro-energy (Energy Commission 2016; 2018; 2019).

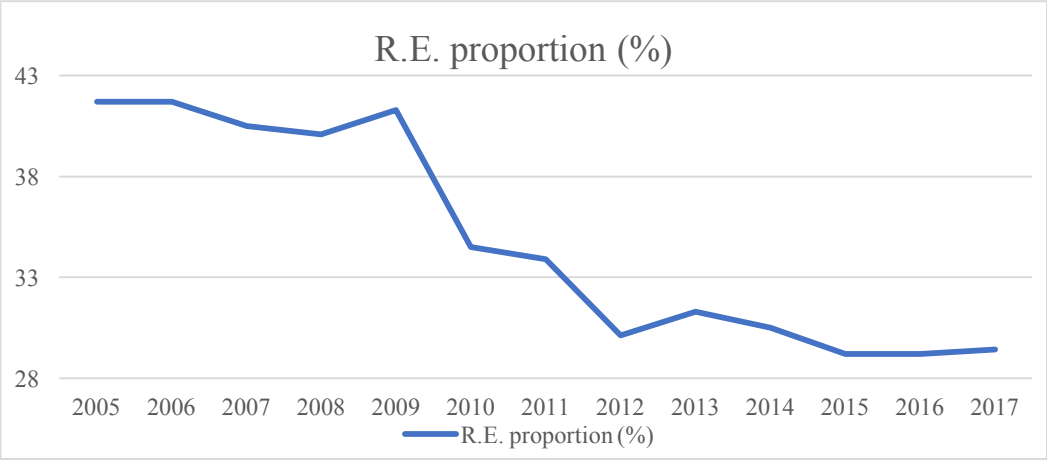

Figure 4.4: Proportion of renewable energy in total primary energy in Ghana, 2005-2017.

Source: Energy Commission (2016; 2018; 2019).

4.3.2.6 Sustainable Development Space (SDS): ecological sustainability and basic needs.

Figure 4.5 shows the graphical representations of the relationship between ecological footprint and HDI in Ghana. For parsimony[11], only fifteen data points for the years between 1990 and 2016 were plotted. The SDS for Figure 4.5 is the lower right quadrant where development would be deemed as sustainable at a maximum EF of 1.7 gha and a minimum HDI of 0.63. From Figure 4.5, the observed pattern shows that none of the data points plotted fell into the SDS space, as ecological footprint increased alongside an increasing HDI.

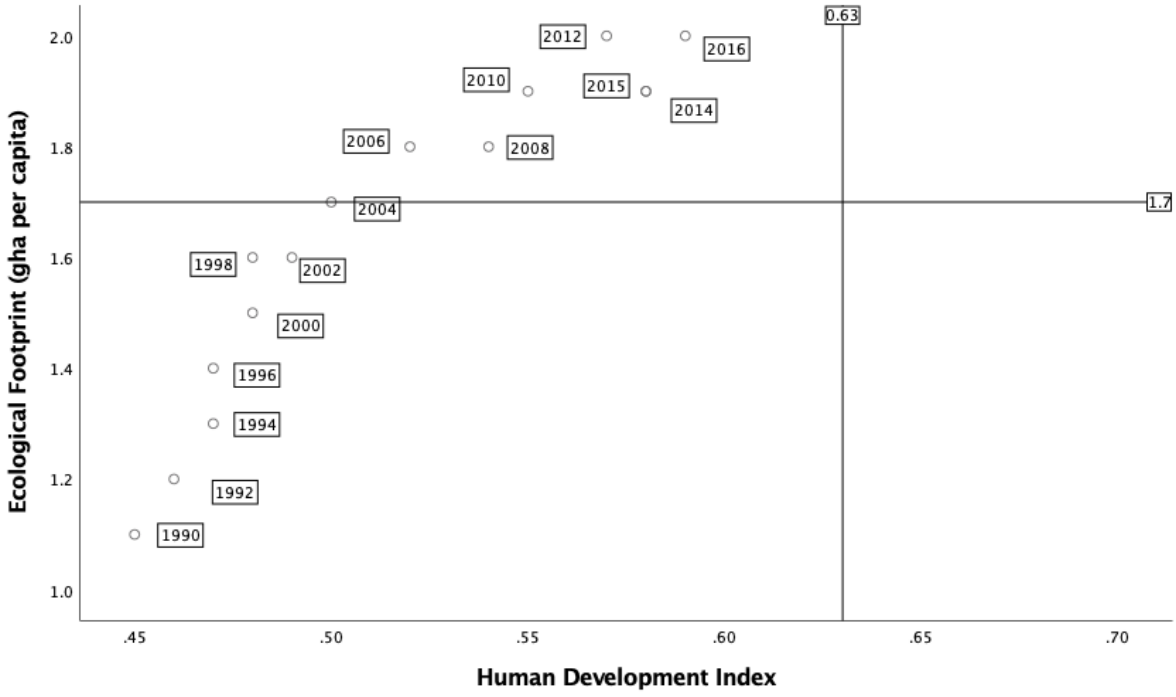

Figure 4.5: The sustainable development space (SDS) for ecological footprint and human development in Ghana.

11 Note: Data on an aspect such as ecological footprint starts from 1965, while that of HDI starts from 1990. Therefore, this was done in order to ensure matching dates for the data on the variables used to plot the SDS graphs.

4.3.2.7 Sustainable Development Space: ecological sustainability and intra-generational equity.

Figure 4.6 shows the graphical representations of the relationship between ecological footprint and the Gini coefficient for Ghana. For parsimony, only six data points for the years 1988, 1992, 1998, 2005, 2012, and 2016 were plotted. The SDS for Figure 4.6 is the lower left quadrant where development would be deemed as sustainable at a maximum EF of 1.7 gha and a maximum Gini Coefficient of 40. From the SDS space shown in Figure 4.6, it was only in 1988 (36) and 1992 (38.4) when inequality was low that development, in the context of ecological sustainability and intra-generational equity, could be deemed as sustainable.

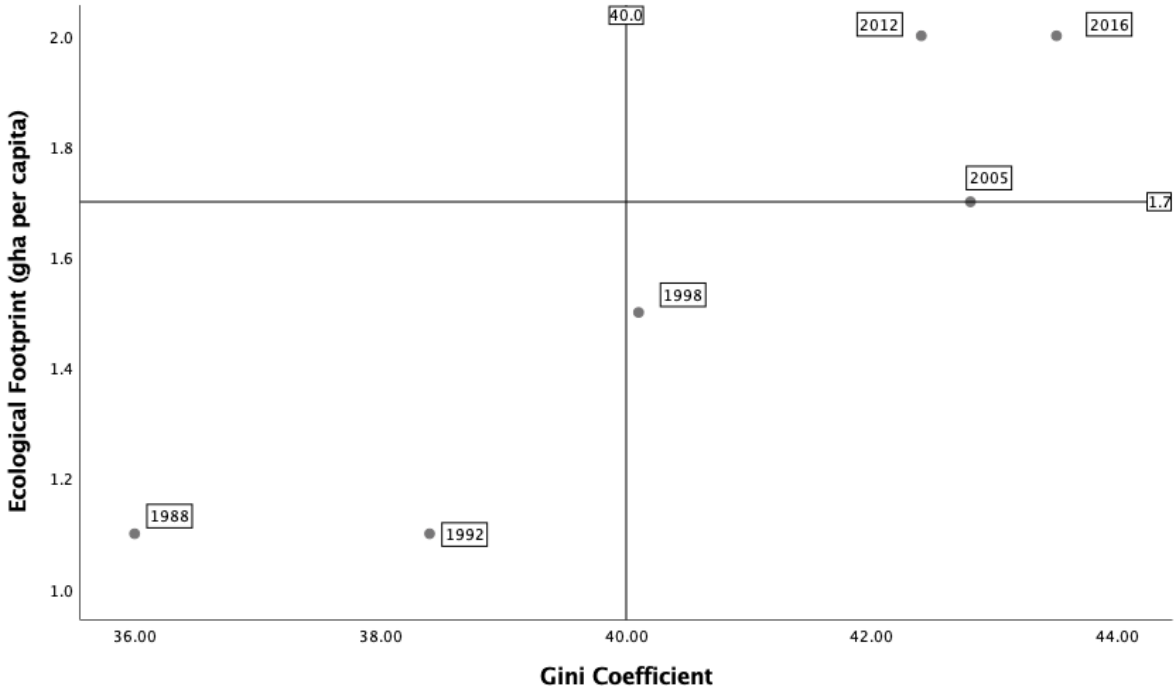

Figure 4.6: The sustainable development space (SDS) for ecological footprint and Gini coefficient.

4.3.2.8 Sustainable Development Space: ecological sustainability and inter-generational equity.

Figure 4.7 shows the graphical representations of the relationship between ecological footprint and renewable proportion of total primary energy. For parsimony, only twelve data points for the years between 2005 and 2016 were plotted. The SDS for Figure 4.7 is the lower right quadrant where development would be deemed as sustainable at a maximum EF of 1.7

gha and a minimum R.E proportion of 27%. From the SDS space shown in Figure 4.7, it was only in 2005 when E.F was 1.7 gha that development, in the context of ecological sustainability and inter-generational equity, could be deemed as sustainable.

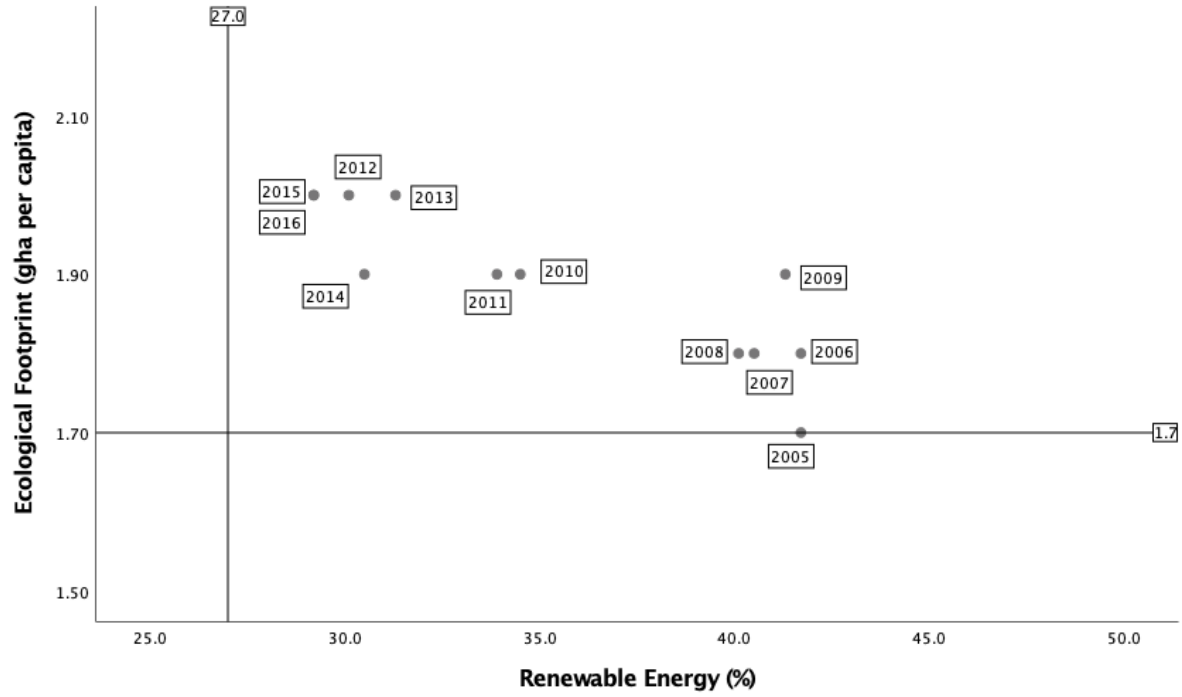

Figure 4.7: The sustainable development space (SDS) for ecological footprint and renewable energy.

4.3.2.9 Sustainable Development Space: basic needs and intra-generational equity.

Figure 4.8 shows the graphical representations of the relationship between HDI and Gini Coefficient in Ghana. For parsimony, only five data points for years between 1990 and 2016 were plotted. The SDS for Figure 4.8 is the upper left quadrant where development would be deemed as sustainable at a minimum HDI of 0.63 and a maximum Gini Coefficient of 40. None of the years plotted fell into the SDS in the upper left quadrant.

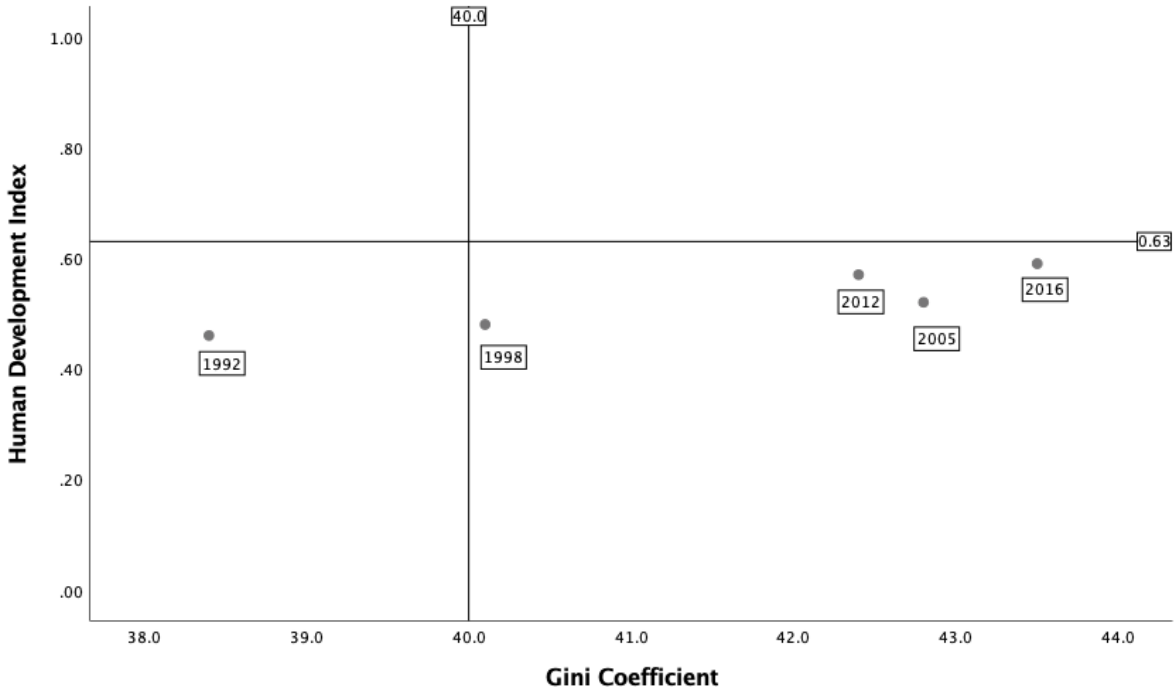

Figure 4.8: The sustainable development space (SDS) for Human Development Index and Gini coefficient.

4.3.2.10 Sustainable Development Space: basic needs and inter-generational equity.

Figure 4.9 shows the graphical representations of the relationship between HDI and renewable proportion of total primary energy. For parsimony, only seven data points for years between 2005 to 2016 were plotted. The SDS for Figure 4.9 is lower right quadrant where development would be deemed as sustainable at a minimum HDI of 0.63 and a minimum R.E proportion of 27%. None of the years plotted fell within the SDS in the context of basic needs and inter-generational equity.

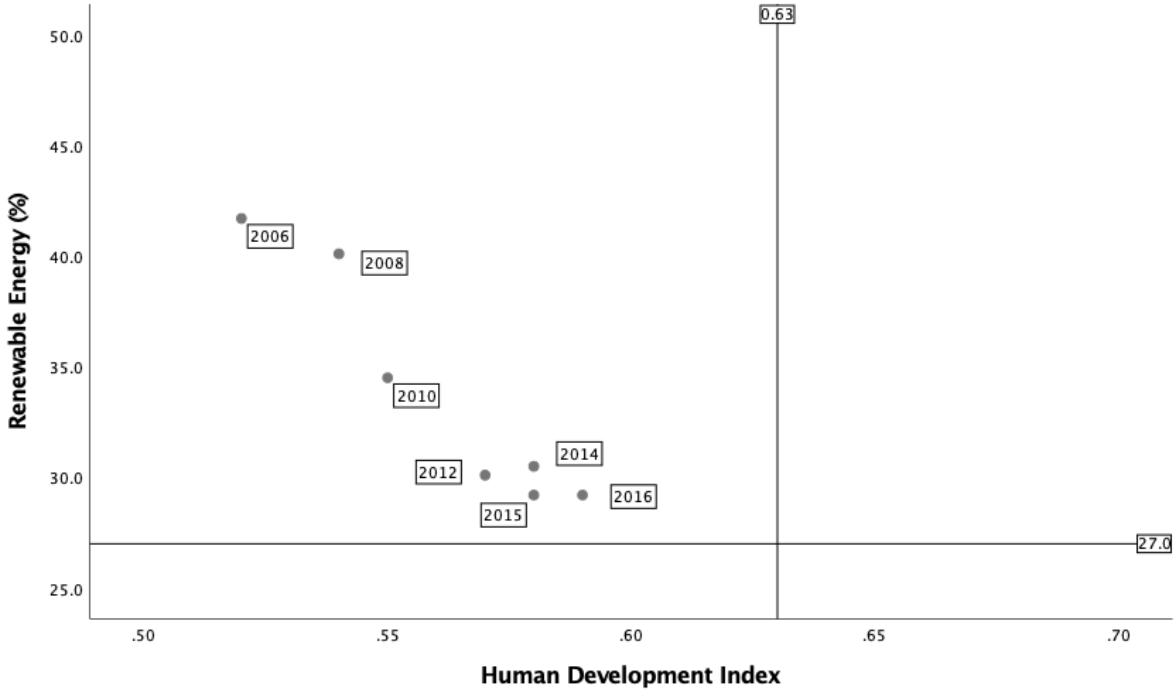

Figure 4.9: The sustainable development space (SDS) for Human Development Index and renewable energy.

4.3.2.11 Sustainable Development Space: inter-generational equity and intra-generational equity.

Figure 4.10 shows the graphical representations of the relationship between the Gini coefficient and renewable proportion of total primary energy. For parsimony, only three data points for years between 2005 and 2016 were plotted. The SDS for Figure 4.10 is the upper left quadrant where development would be deemed as sustainable at a maximum Gini Coefficient of 40 and a minimum R.E. proportion of 27%. None of the years plotted fell into the SDS in the context of inter- and intra-generational equity.

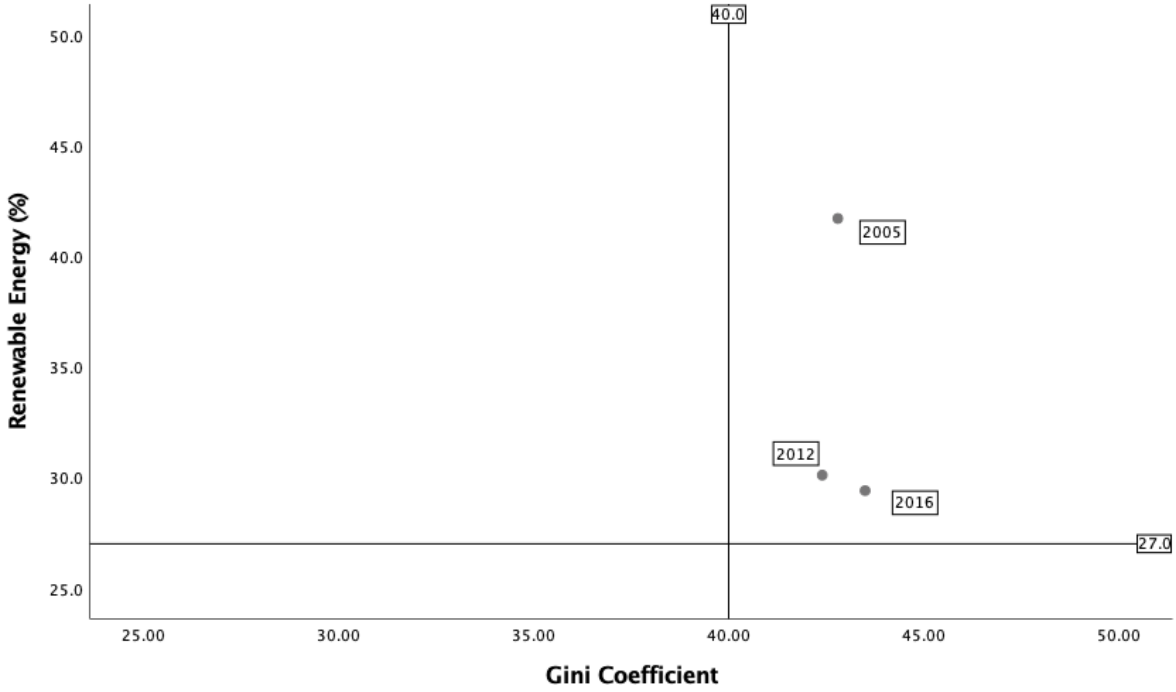

Figure 4.10: The sustainable development space (SDS) for Gini coefficient and renewable energy.

4.3.3 Discussion.

4.3.3.1 Sustainable Development Space: ecological sustainability and basic needs.

The consistent increase in Ghana's per capita ecological footprint (as shown in Figure 4.2) could be directly related to the relatively improved levels of socio-economic well-being in Ghana (as measured by the HDI in Figure 4.1). Here, it can be argued that the strive to provide the basic needs of an increasing population places greater demands for ecological resource exploitation, leading to an increased ecological footprint (Holden et al. 2014). A potential explanation for this observation is the scenario that, in an increasingly modernising world, the application of new technology has led to better ways of resource exploitation. In the Ghanaian case, this can be explained by the shift from subsistence farming to mechanised farming. Here, the application of technology potentially leads to diverse outcomes. For example, leveraging technology for resource exploitation could lead to increased efficiency and productivity such that wastes are reduced. Alternatively, maximising full technological benefits for resource exploitation and compensating for the capital-intensive nature of such technologies could lead to the exploitation of more resources and increased ecological footprints. For example, more land will be needed for commercial farming in this scenario.

Thus, with an increasing population and the need to improve socio-economic well-being, technology has potentially been leveraged to maximise resource exploitation.

The interface of ecological sustainability and basic needs is premised on the notion that there is no trade-off between environmental development and socio-economic development in terms of achieving basic needs such as income and education, but rather decisions on environmental development are fundamentally underpinned by the need to provide the basic needs of society within the biophysical limits of the environment. Humans, as an important part of socio-ecological systems, are the bridge between the ecological systems and the socio-economic systems (see for example, Costanza et al. 2007). This is because it is humans who determine the resources they require from the ecological environment to maintain their subsistence. Thus, in this case, the quality, quantity, and exploitation levels of ecological resources will directly or indirectly affect the ability of humans to meet their socio-economic needs (basic needs in this case). The pattern observed in Figure 4.5 shows that Ghana's ecological footprint per capita increased alongside increases in HDI, resulting in none of the years plotted falling within the SDS. This is consistent with the findings of Holden et al. (2014), whose study on 167 countries showed increases in ecological footprint when HDI increased. Figure 4.2 has shown that Ghana is increasingly dependent on and potentially over-exploiting its ecological resources because while its ecological footprint per capita increased, its bio- capacity decreased within the period measured. A significant inference made from Figure 4.2 is that, theoretically, Ghana had a bio-capacity deficit of -0.7 ha per capita in 2016 compared to a bio-capacity reserve of 1.5 ha per capita in 1965. Thus, with rising concerns about the limits of the biophysical environment, there is an imminent risk that the viability of the ecological environment to help provide the basic needs of society will diminish, should the current regime and practices continue.

4.3.3.2 Sustainable Development Space: ecological sustainability and intra-generational equity.

The interface of ecological sustainability and intra-generational equity is premised on the notion that inequalities in the current generation will compromise ecological sustainability. From the literature (see Section 2.3.1), this has been succinctly captured by the Brundtland Commission (WCED 1987, p.72) as they stated that *"those who are poor and hungry will often destroy their immediate environment in order to survive: they will cut down forests;*

their livestock will overgraze grasslands; they will overuse marginal land; and in growing numbers they will crowd into congested cities. The cumulative effect of these changes is so far-reaching as to make poverty itself a major global scourge". Consistent with the widening inequality (Figure 4.3) and increasing ecological footprint in Ghana (Figure 4.2), a positive relationship between ecological footprint and Gini coefficient was observed for the data points plotted in Figure 4.6 and none of the data points fell within the SDS. The logical implication of this finding is that pervasive inequalities, which are exacerbated by high levels of poverty in Ghana, mean that the country (including people) is compromised in its ability to make decisions that could potentially safeguard ecological sustainability. Unlike Holden et al. (2014) who could not establish a relationship between ecological sustainability and intra-generational equity in their study, the arguments based on Figure 4.6 are consistent with the findings of Wilkinson and Pickett (2009) who argue that communities with low levels of inequality perform better when assessed on a wide range of positive features including life expectancy when compared to communities with high inequalities. In this case, widening inequality in Ghana means that Ghana's scores on environmental quality will be lower, as evidenced in increasing ecological footprint. The implications of this scenario can be demonstrated with the analogy of how poverty perpetrates wide inequalities and threatens ecological sustainability, as well as the very survival of citizens. In this instance, widening inequality in Ghana means that the poor will potentially attempt to survive by exploiting and overexploiting ecological resources at their disposal. For example, the poor could attempt to harvest ecological resources such as forest products to sell for income. This leads to deforestation, which has attendant consequences, including flooding, loss of species, carbon release, etc. Thus, the exploits of the poor for survival could create a range of pernicious consequences which threaten ecological sustainability, for which the poor are often the primary victims (see, for example, Okyere et al. 2012). From the findings, it can be argued, in the context of the relationship between ecological sustainability and intra-generational equity in Ghana, that inequality compromises ecological sustainability as it potentially reduces the urgency and public demand for the protection and exploitation of ecological resources within acceptable biophysical limits. This is because inequality potentially leads to increasing dependence by the poor on these resources for their livelihoods, while it reinforces the capacity and powers of the rich and market actors (for example, MNCs) to prevent such exploitation or protection.

4.3.3.3 Sustainable Development Space: ecological sustainability and inter-generational equity.

A central question that emerges from the findings is whether the present Ghanaian generation has an underlying duty to conserve and protect the environment for its future generation. Beyond the reality that current patterns of exploitation of ecological resources (as measured by the ecological footprint) are at the highest levels ever (Figure 4.2), by signing on to the various international charters on sustainable development (for example, the Rio Declaration on Environment and Development [1992]), Ghana establishes an indirect fiduciary relationship with the future generation with respect to ecological sustainability. In this context, Ghana has a passive obligation under these international instruments to pursue development in a way that does not compromise the ability of the future generation to do the same (WCED 1987). The evidence from Figure 4.7 implies that although the renewable energy remained above the 27% minimum threshold recommended, development was still deemed as unsustainable due to increasing E.F. This situation contrasts with the findings of Holden et al. (2014) who found that countries with a higher proportion of renewable energy tend to have lower ecological footprints. In a practical sense, it can be inferred from the evidence that although Ghanaian stakeholders (including government and private sector) might offer some statements in their development visions or in corporate social responsibility statements to underline their commitment to long-term and future-focused ecological sustainability, the development priorities of government and investment interests of private sector stakeholders mean that few of these statements are translated into tangible decisions and actions. It is true that in providing for the basic needs of its citizens, Ghana relies directly or indirectly on the extraction of its ecological resources and the country also relies on these same ecological resources to assimilate waste. It is also not a straight-forward process to determine the quantum savings on ecological resources that the present generation must make for the future generation. Nevertheless, a rising ecological footprint, made worse by a decreasing share of the renewable energy proportion of the country's total primary energy supply, may be an indication that the ecological sustainability ambitions of the present generation are incongruous with the ecological sustainability prospects of the future generation. In this case, one can argue that Ghana's sustainable development journey should be about more than just environmental development or protection, but rather, it should have a temporal focus or threshold. This is important in order to ensure that the current generation lives within the biophysical limits of the environment without compromising the ability of the future generation to do the same. Overall, the findings are an indication that the ecological

sustainability of Ghana's future generation is dependent on the altruism extended by the current generation, and for a less-developed country like Ghana, the ecological sustainability of the current generation depends on the extent to which they exploit ecological resources.

4.3.3.4 Sustainable Development Space: basic needs and intra-generational equity.

The interface between basic needs and intra-generational equity in this study is premised on the notion that a fair opportunity exists for all members of society to meet their basic needs and improve their levels of socio-economic well-being (as measured by the HDI). The consistent increase in Ghana's HDI (as shown in Figure 4.1), implies that there have been significant improvements in the socio-economic well-being of Ghanaians. At the same time, inequality has widened with a consistent increase in Ghana's Gini coefficient score (as shown in Figure 4.3). Subsequently, evidence from Figure 4.8 shows that while HDI levels have improved, Gini coefficient scores have risen and thus, Ghana has exceeded the maximum Gini coefficient level of 40 and has also not reached the minimum HDI level of 0.63 in order to fall into the SDS in the context of 'basic needs and intra-generational equity'. In other words, while general socio-economic well-being has improved, inequalities have increased in Ghana and compromised the ability to safeguard the basic needs of all citizens (Holden et al. 2014). This finding confirms those from previous studies (Holden et al. 2014; Wilkinson and Pickett 2009) which suggest that the possibility of safeguarding the basic needs of all citizens is higher in countries with low inequalities than it is in countries with higher inequalities. The findings (Figure 4.1; Figure 4.3; Table 4.2) imply that the well-being gains made by Ghana have not been transposed into greater and fairer levels of welfare for all members of society. This occurrence is elucidated by the inequality-adjusted HDI (IHDI) values for Ghana in 2017 (as shown in Table 4.2). In 2018, an HDI value of 0.596 was recorded for Ghana (see Table 4.1). However, as shown in Table 4.2, discounting the HDI value for inequality in the distribution of the components of the HDI results in a 28.3% loss in HDI value to an IDHI of 0.427. This finding is an indication of the state of well-being of a sizeable number of Ghanaians. This is because inequalities in the context of fulfilling the basic needs of the present generation mean that access to public and personal goods such as health, education, and income are affected. This has potentially damaging effects on the opportunities that exist for citizens to fulfil their basic needs, as the higher inequality levels could affect the social mobility of citizens. Thus, the findings correspond with that of Wilkinson and Pickett (2009) who highlighted how increasing inequality can cause health problems (see Section 4.2). The

findings also give essence to the picture portrayed in Section 4.2 (see, for example, Okyere et al. 2012; OECD 2013) where the urban poor in Ghana bear a disproportionate burden of the impact of socio-economic inequalities. The scenario extended here is that, when it comes to fulfilling basic needs, as shaped by the HDI, the poor in Ghana are potentially likely to attain low education, low incomes, and worse health outcomes, compared to the rich who are likely to be well educated and healthier. To sum up, it is suggested from the interpretation of findings on SDS in the context of 'basic needs and intra-generational equity' that access to basic needs in Ghana is socially defined (Wilkinson and Pickett 2009). While this assertion does not assume an institutionalised form of limitation on citizens, it suggests that the specification of the level of access of citizens to fulfil basic needs is influenced by the social organisation created by wide inequalities (as portrayed by Ghana's Gini coefficient scores over the years). Essentially, addressing the problem of disparities in intra-generational access to basic needs in Ghana will require efforts to mitigate the stratification created by wealth inequality. It is in cognisance of this reality that policies such as Free Compulsory Universal Basic Education, which was formulated and implemented in 1995 with the aim of achieving universal education by 2005 (Acheampong 2009), were introduced to promote sustainable development (see Section 4.3.1). While discussions on progress with respect to whether targets were reached, especially in relation to benefits for the poorest households, are beyond the scope of the current discussion, the exigency to address intra-generational inequalities in Ghana (in terms of access to basic needs like education), is reflected in the implementation of a Free Senior High School Policy by the government in power in 2017 (Arthur-Mensah and Alagaraja 2018).

4.3.3.5 Sustainable Development Space: basic needs and inter-generational equity.

The interface between basic needs and inter-generational equity in this study is premised on the notion that a fair opportunity exists for improved socio-economic well-being for the future generation if the current generation can adequately meet their basic needs (as measured by the HDI). The analysis from Figure 4.9 shows that although renewable energy proportions have remained above the minimum threshold of 27%, Ghana's HDI level, despite the improvements, has not reached the minimum threshold of 0.63 beyond which Ghana will fall into the SDS in the context of 'basic needs and inter-generational equity'. An important observation from the data (Figure 4.1; Figure 4.4; and Figure 4.9) was that as HDI levels improved, renewable energy proportion decreased. This is consistent with findings from

Holden et al. (2014) who concluded from their research that countries creating a high HDI expend high amounts of energy, making it likely that their renewable energy sources will deplete at fast rates. In a practical sense, the links between providing basic needs and inter-generational equity in Ghana can be expressed in different ways. For example, as the current generation puts in place socio-economic structures to provide their basic needs, these same structures are expected to affect the future generation. In this case, better education of the current generation means that they can create the necessary foundations for the education of the future generation. Similarly, adequate healthcare for the current generation is an indication of beneficial health investments which could accrue benefits for the future generation.

4.3.3.6 Sustainable Development Space: inter-generational equity and intra-generational equity.

It is assumed that Ghana's sustainable development expectations involve providing opportunities for the desirable well-being of the present generation as well as the future ones. Accordingly, the analysis from Figure 4.9 shows that while renewable energy proportions (Figure 4.4) have remained above the minimum threshold of 27% for all the data points plotted, Gini coefficient (Figure 4.3) has increased beyond the maximum threshold to fall into the SDS in the context of 'intra-generational equity and inter-generational equity'. This is consistent with the findings from Holden et al. (2014) whose research suggested a weak but positive correlation between Gini coefficient and renewable energy proportion of total primary energy. From the considerations above, the complexity of the inter-linkages between inter-generational equity and intra-generational equity is clear, but of considerable importance. Exploring Ghana's sustainable development from an intra-generational *vs* inter-generational perspective has given a broader approach that accounts for inequalities in the distribution of socio-economic progress and ecological resources within generations and between generations. The findings subsequently indicate an inherent conflict between the distribution of resources for the current generation and opportunities for the future generations in Ghana to enjoy the same. The implication of the findings is that if Ghana continues as a country without an aversion for social, environmental, and economic inequalities, the depressive effect on the overall well-being of its citizens will persist within and among generations. Therefore, based on the evidence presented, in order for Ghana to

develop sustainably, it must offer the same opportunities for a better life to its future generations as it does for the present generation.

4.3.4 The state of sustainable development in Ghana.

It is a long journey to sustainable development. The graphs produced to capture the sustainable development space (Figure 4.5; Figure 4.6; Figure 4.7; Figure 4.8; Figure 4.9 and Figure 4.10) have helped to determine Ghana's sustainable development trajectory within the boundaries of the dimensions analysed. Based on the evidence gathered and subsequently discussed, it is clear that Ghana falls short with respect to meeting the threshold conditions for sustainable development. In Ghana's journey to sustainable development, the evidence presented in Table 4.1 and Figure 4.1 for HDI shows that Ghana is increasingly making socio-economic progress in a bid to safeguard the basic needs of its citizens. At the same time, from the evidence presented in Figure 4.2 (Ecological Footprint), Figure 4.3 (Gini Coefficient) and Figure 4.4 (renewable energy proportion), it is seen that Ghana's ecological footprint has increased and exceeded its bio-capacity, inequality has risen, and from an inter-generational perspective, its renewable energy proportion of primary energy has been decreasing. This has potential consequences of eroding the earlier progress by increasing environmental costs and weakening social connections, as well as undermining other poverty reduction efforts. Essentially it prompts questions about how far Ghana is willing to go in order to safeguard the basic needs of its citizens.

Sustainable development assumes an egalitarian principle which gives equal opportunities to all members of society (WCED 1987). Thus, in the context of intra-generational equity, it can be inferred from the evidence presented that Ghana has retrogressed in translating socio-economic growth into approaches that deal with inequalities, as shown by the steady rise in Gini Coefficient over the years. This suggests that intra-generational equity is exacerbated by government policies and programmes, or shaped by systemic factors, of which poverty is prominent (see Section 4.2). In the context of inter-generational equity, the perspective of this study, based on the evidence presented, is that the uptake and enforceability of the fiduciary duty of ensuring inter-generational equity are questionable. Despite stakeholders' commitment to upholding the rights of future generations to equal opportunities in life by consenting and ratifying various international charters on SD, inter-generational equity is either mere rhetoric, or not the topmost priority of Ghana's successive governments due to

the pressing need to provide basic needs for citizens; or the concept of inter-generational equity has not been adequately streamlined into Ghana's sustainable development policies, plans, and projects. Overall, a constant factor which permeates any attempt to rationalise what may influence the developmental choices and options available to Ghana in her quest for sustainable development is the currently low developmental levels (Holden et al. 2014) which can be described through poverty (i.e., a lack of economic resources both at the State level and also on the part of individuals). Based on the scenario described above, one can argue that both the current and future Ghanaian generations must have adequate economic resources in order to satisfy their basic needs and to protect the integrity of the ecological environment, which, in this case, includes utilising the ecological resources that are meant to be protected. In other words, the capacity of Ghanaian society to pursue sustainable development may seem to be dependent on economic performance. Nevertheless, going by the Brundtland Commission's definition of sustainable development, it is evident that if indeed a country such as Ghana is committed to SD principles, then its SD performance should not merely hinge on its socio-economic performance. While this does not discount the critical role of economic development, the argument advanced here is that economic performance in development is not the sole objective of sustainable development (Holden et al. 2014), a position succinctly captured in the first Human Development Report in the 1990s as: "*the purpose of development is to offer people more options. One of their options is access to income—not as an end to itself but as a means of acquiring human well-being. But there are other options as well, including long life, knowledge, political freedom, personal security, community participation and guaranteed human rights. People cannot be reduced to a single dimension as economic creatures"* (UNDP 1990, p.iii). Based on the evidence presented in the findings and taking cognisance of the 'poverty factor' in Ghana, the perspective of this study is that, as much as sustainable development in Ghana depends on economic, social, and environmental development progress, it also depends on the political salience attached to it. Therefore, Ghana's progress from a sustainable development perspective is also primarily a matter of political priority. This is because rather than following utopian interpretations of sustainable development or making decisions based on political expediency, Ghana, as a less-developed country, could still pursue political choices that will put her on a path to sustainable development. For example, irrespective of the economic situation, Ghana could still pursue SD if the country's leaders make choices that ensure equality of opportunity irrespective of gender, generation, among others, such that

citizens are not left behind by economic progress, social mobility and environmental conditions.

4.4 Urbanisation in Ghana

4.4.1 An overview of urbanisation in Ghana.

In 2010, Ghana's urban areas were officially home to more than half of the country's population (Cobbinah et al. 2015a). Therefore, the management of the process of urbanisation is critically important, and will determine whether the country will reap or lose dividends from the demographic and structural shift. As already mentioned in Chapter Two, there is no common agreement on the definition of an 'urban' centre. How an urban area is constituted and defined remains an open question, usually subject to the interpretation of the particular country involved. Thus, the notion of what constitutes an urban area in developed countries is different from that of developing countries. However, Ghana uses a population (geographic) approach by which an urban area is defined as a settlement with a minimum population threshold of 5,000 or more people (NUP 2012). As in other parts of the developing world, increasing urbanisation in Ghana has been attributed to factors which include rural-urban migration, natural population growth, and reclassification of settlements (Ardayfio-Schandorf et al. 2012).

The urbanisation process in Ghana has led to changes in demography and landscape. From a demographic perspective, post-independent programmes including the industrialisation and structural adjustment programmes widely influenced urban population growth. A World Bank (2015) study showed that the urban population in Ghana increased from 4 million in 1984, to about 13 million by 2013. The demographic transition has, in turn, resulted in changes to the landscape due to the progressive conversion of land to meet urban needs. Numerous documented examples exist of pressure being brought to bear on land owners to convert fragile land cover types such as water bodies and wetlands to urban use due to the high demand for land (see, for example, Wiegleb 2016; Amo et al. 2017). For example, Amo et al. (2017) conducted an investigation into the acquisition and development of wetlands in Ghana and established that wetlands were increasingly being converted into residential and commercial uses in Kumasi due to rapid urbanisation. Accordingly, research has emerged to document the urbanisation process and patterns in Ghana. For example, Coulter et al. (2016)

have conducted a classification and assessment of land cover and land use change in southern Ghana using remotely-sensed satellite imagery. Their findings indicate that the increasing urban population in Ghana has resulted in urban expansion, and has led to the reduction of natural land cover in Ghana. In the southern part of Ghana where urbanisation is rapid, Coulter et al. (2016) concluded that urban expansion has reinforced environmental degradation patterns that started before the year 2000. Similarly, Attua and Fisher (2011) have analysed historical and future land cover change in the New Juaben Municipality in Ghana. Their study provided empirical evidence of rapid urbanisation in Ghana, and they concluded that urbanisation, as characterised by expanded urban physical infrastructure, had led to the decline in natural vegetation cover which was primarily characterised by rapid loss in hitherto arable lands. Nevertheless, the rapid nature of the urbanisation process in Ghana means that there is still limited understanding; and the existing literature has mainly focused on a single city or region as the unit of analysis (see, for example, Attua and Fisher 2011; Coulter et al. 2016). This potentially means that differences in urbanisation patterns of different city scales (for example, between small cities and large cities) are rarely discussed, although variations in factors such as socio-economic conditions or geophysical conditions may shape their respective urbanisation patterns (Abulibdeh et al. 2019). The argument above suggests that gaining a deeper understanding of the urbanisation process in Ghana will require an appreciation of the patterns in multiple cities. Accordingly, the limited and highly-nuanced nature of scholarly work on urbanisation in Ghana means that in the context-specific study of the interactions between urbanisation and sustainable development, bespoke analysis of local urbanisation patterns and dynamics becomes a critical requirement.

The urbanisation process in Ghanaian urban areas shares similar characteristics with other urban areas in the sub-region, as it has occurred without significant industrialisation and transformation of rural areas. The country's recent wave of urbanisation since the turn of the millennium, coincided with significant socio-economic growth as, for example, industrial and service jobs grew from 38% in 1992 to 59% in 2010 (World Bank 2015). However, these employment opportunities have not happened in sectors considered critical to sustained economic growth (World Bank 2015). It is plausible to observe that increased urbanisation and population growth in Ghana have given rise to urban poverty, as has been discussed in Section 4.2.1.3. Thus, in the coming decades, a significant challenge for the country is how it will develop while maintaining the economic, social, and ecological integrities of urban systems.

4.4.1.1 Urbanisation and mining in Ghana.

Ghana has significant mineral resources and is one of the leading producers of gold in the world (ICMM 2007). Pre-independence, Ghana was known as Gold Coast, an indication of its mineral wealth. Mining provides significant taxes, revenues, and dividends for the country. For example, mining contributed to about 7% of the country's Gross Domestic Product (GDP) and about 40% of total merchandise export in 2011 (Akafia and Kuenyehia Sr. 2012). Scholars suggest that significant natural resource exports propel urbanisation, especially when the financial rewards accrued are used to provide urban goods and services to the populace (Gollin et al. 2013; Jedwab 2013; Cavalcanti et al. 2014). However, others (UNECA 2012a; Turok and McGranahan 2013) have also shown that natural resource-based economies are not naturally urban-oriented. The situation can be linked to the emerging concept of Resource-Based Cities (RBC), which have been defined as urban areas whose existence and economies are primarily based on the exploitation, extraction and processing of natural resources (Li et al. 2013), and include oil extraction, mining of mineral ores and forestry, etc. Given the importance of mineral exports to the national economy of Ghana, the influence of mining on urbanisation and its inter-linkages with the development of the urban areas which host the mining projects should not be overlooked. Concomitant with the start of mining operations is the migration of people into mining centres. As Hilson (2002a; 2002b) reports, the Ghanaian mining industry has been attracting migrants from within and outside Ghana for over one hundred years, fuelled by the desire of those migrating to seek better life opportunities. In a different vein, Hilson et al. (2014) note that as of the year 2005, there were over 50,000 Chinese migrants engaged in illegal mining in Ghana. Thus, together with natural population growth, migration has provided a central impetus to urbanisation in mining centres in Ghana. Given the country's history of mining (Hilson 2002a), several studies have been conducted to explore the relationship between the mining industry and the national economy, its impact on the environment and the role of corporate social responsibility (for example Aryee et al. 2003; Bloch and Owusu 2012, Hilson 2012; Standing 2014). However, there is little research on the interactions between mining and urbanisation. Gough and Yankson (2012) argue that although a lot has been written about mining in Ghana and also about urban settlements, these studies have been considered independently by the scholars in the respective fields. There is a poor understanding of the inter-linkages between mining and urbanisation due to the limited literature that consider both fields together. For instance, while the physical legacy of mining is understood in terms of the harmful externalities on the

environment, not much has gone into exploring the relationships between such externalities and the profound impact of mining on urbanisation and urban growth.

The mining settlement of Obuasi serves as a useful example. Obuasi is the location of the oldest gold mine in Ghana, which has been in operation for over one hundred years (Wan 2014). Mining has fuelled far-reaching processes of urbanisation in Obuasi, resulting in a rapid increase of its population from 22,800 in 1960, to about 203,554 in 2019, according to census data (Ghana Statistical Service 2002; Ghana Statistical Service 2014c; Ghana Statistical Service 2019), making it one of the largest urban areas in Ghana. The capital-intensive nature of large-scale mining operations means that only a few thousand people are directly employed at the mine, while the diverse nature of the local economy ensures that the town is not entirely dependent on the mine. Nevertheless, Gough and Yankson (2012) maintain that the principal reason for the existence and continuous growth of Obuasi is due to the mine. Aside from socio-economic benefits accrued from mining, it has been reported that processes associated with mining in Obuasi and its environs have led to widespread water pollution (ActionAid Report 2006; Foli et al. 2012; Azumah et al. 2019). Furthermore, it has been reported that mining-related activities have contributed to an increasing number of school dropouts in the Obuasi area as some youth tend to engage in small-scale mining at the expense of their education (Azumah et al. 2019). As the largest and most important town in the history of mining in Ghana, a lot of mining-related studies have been conducted on the Obuasi mine and its catchment area. Although not an exhaustive list, for example, Adu-Poko et al. (2012) have studied land cover changes in the Obuasi mine catchment, while Wan (2014) has also explored the environmental justices and injustices in three mining communities in Obuasi. In addition, Opoku-Mensah and Asare-Okyere (2014) have studied company-community conflicts over gold mining in Obuasi. Despite these studies, the extent to which the ills and the virtues of the large and complex urban agglomeration, of which Obuasi is at the core, is owed to mining, is poorly understood and rarely acknowledged. This is surprising because, like many other countries in SSA, mineral resource mining is fundamental to the Ghanaian economy and resource-based towns feature prominently in the country's economic and social geography. Particularly important for this research, there is limited knowledge on urbanisation and mining in the context of sustainable development, whereby the implications of urban growth through both population and landscape change are constructively considered.

4.4.2 An assessment of urbanisation in Ghana.

4.4.2.1 Urbanisation trends.

In order to highlight the trends of urbanisation in Ghana, the analysis that follows deploys past, current, and projected urbanisation in Ghana and refers to global statistics. In Table 4.3, past and projected urban population, urbanisation level and urbanisation rates over a ten-decade period are presented. As seen from Table 4.3, Ghana had an urban population of 769,000 people in 1960, which represented an urbanisation level of 15.44%. By 2000, Ghana's urban population was 8,424,000, representing an urbanisation level of 43.95%. By 2010, over half of the Ghanaian population was living in urban areas as it recorded an urban population of 12,492,000, representing an urbanisation level of 51.22%. In terms of the future urban population, Ghana is projected to have an urban population of 35,520,000 people by 2050, representing an urbanisation level of 72.33%. The rate of change in urbanisation level was relatively higher, at 3.94% for the one-decade period (2000-2010) compared with 4.79% for the five-decade period (1950-2000). The table also shows that up until 2010, urbanisation in Ghana had been below or consistent with global levels. However, projected future urbanisation for 2010-2050 is expected to be higher in Ghana at 2.61% compared with the global level of 1.41%.

Table 4.3: Urban population, urbanisation level and urbanisation rates in Ghana compared with World figures.

Location	**Population ('000)**				**Urbanisation level (%)**				**Urbanisation rates (%)**		
	1950	**2000**	**2010**	**2050**	**1950**	**2000**	**2010**	**2050**	**1950-2000**	**2000-2010**	**2010-2050**
Ghana	769	8,424	12,492	35,520	15.44	43.95	51.22	72.33	4.79	3.94	2.61
World	745,495	2,858,632	3,558,578	6,352,175	29.44	46.69	51.60	67.18	2.69	2.19	1.41

Source: Cobinnah et al. (2015a) as adapted from UNDESA / PD (2012) and UNDESA / PD (2013).

4.4.2.2 Urbanisation patterns in the major urban areas in Ghana, 1970- 2010.

Rapid urbanisation is also observed through the urbanisation patterns of the major cities in Ghana (as shown in Figure 4.11). From this, it can be seen that urbanisation is skewed

towards the two largest cities, Accra and Kumasi, as their combined population represented 63% and 32% of Ghana's urban population in 1970 and 2010 respectively. In 1970, only Accra had a population of over 500,000. By 2010, both Accra and Kumasi were estimated to have populations of over 2 million people each. It is also evident that smaller urban areas have also urbanised rapidly in both absolute and relative terms. For example, the urban population in Sekondi-Takoradi was estimated at 500,000 in 2010. Despite the spread of urbanisation across the country, the findings show that the two biggest cities, Accra and Kumasi, remain as the major containers of urban population and economic opportunities.

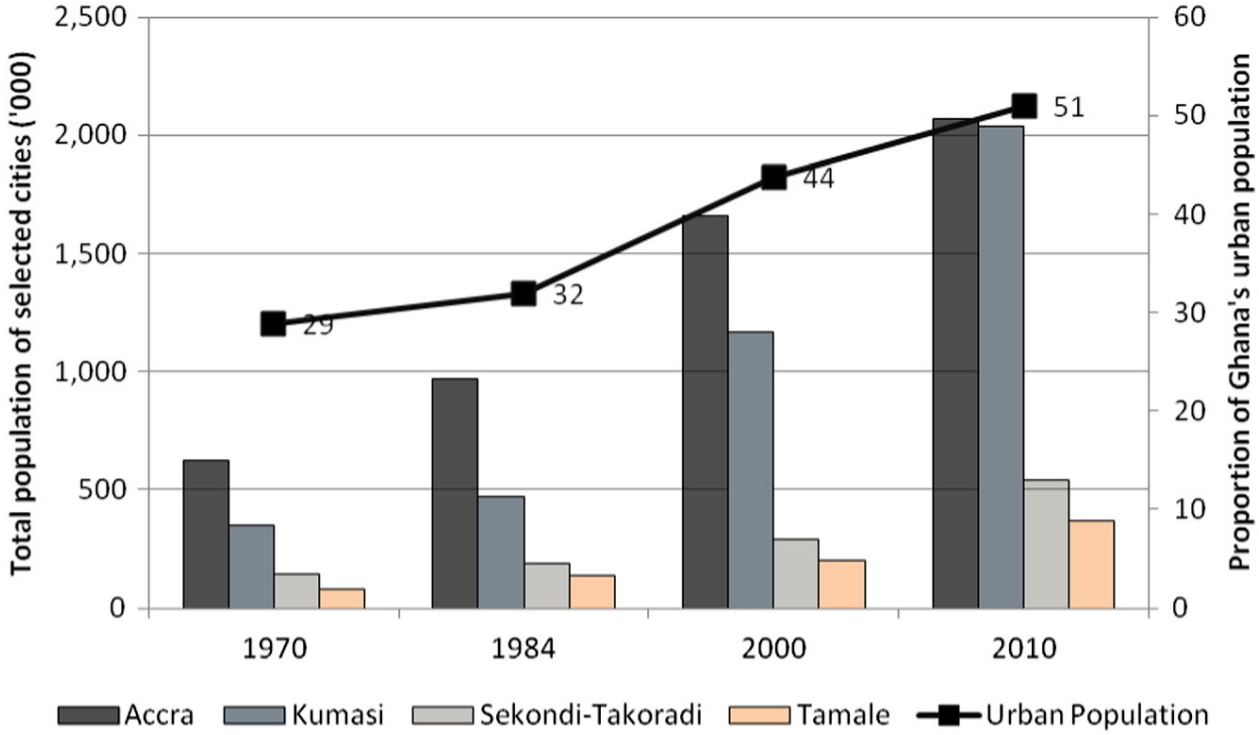

Figure 4.11: Urbanisation patterns in the major urban areas in Ghana, 1970 - 2010.
Source: Cobinnah and Niminga-Beka (2017) as adapted from GSS Records (2012; 2013).

4.4.2.3 Rural-urban migration and natural population growth.

Table 4.4 shows the contribution of rural-urban migration and natural population growth to urbanisation in Ghana between 1984 and 2010. Overall, natural population growth was the greater contributor to urban population growth, contributing an average of 60% over the period. Their respective contributions also remained constant over the period. For example, urban growth due to migration from rural areas contributed 37.4% and 40.7% respectively, for the periods 1984-2000 and 2000-2010. At the same time, natural population growth contributed 62.6% and 59.3% to overall urban growth during the periods 1984-2000 and

2000-2010 respectively. When considered on a regional basis, the findings show that the contributions of rural-urban migration and natural population growth to urbanisation are mixed. For example, in the Western Region, urban growth due to migration contributed 59.2% between 1984-2010, a statistic that had reduced to 31% for the 2000-2010 period. However, in the Northern Region, urban growth due to migration contributed 11.3% between 1984-2010, a statistic that had increased to 44.6% for the 2000-2010 period. This suggests that how urbanisation manifests at the local level in Ghana is not homogenous.

Table 4.4: Contribution of rural-urban migration and natural population growth to urbanisation in Ghana.

Region	Urban Population		% of growth due to migration		% of growth due to natural increase	
	1984-2000	***2000-2010***	***1984-2000***	***2000-2010***	***1984-2000***	***2000-2010***
All regions	8,274,270	12,545,229	37.4	40.7	62.6	59.3
Western	698,418	1,007,969	59.2	31.0	40.8	69.0
Central	598,405	1,037,878	51.1	58.3	48.9	41.7
Gt. Accra	2,547,684	3,630,955	4.1	28.1	95.9	71.9
Volta	441,084	713,735	54.8	50.5	45.2	49.5
Eastern	727,914	1,143,918	54.6	46.5	45.4	53.5
Ashanti	1,853,065	2,897,290	56.3	45.7	43.7	54.3
Brong Ahafo	678,780	1,028,473	53.9	40.6	46.1	59.4
Northern	483,790	750,712	11.3	44.6	88.7	55.4
Upper East	144,282	219,646	57.5	41.4	42.5	58.6
Upper West	100,848	114,653	71.6	-123.5	28.4	223.5

Source: Ghana Statistical Service (2014a).

Note: The regions in Ghana increased from 10 to 16 in 2019.

4.4.2.4 Urbanisation and economic growth.

In order to explore the relationship between urbanisation and economic growth in Ghana, the country's Gross National Income (GNI) figures were compared with the levels of urbanisation over time, as shown in Table 4.5. From the comparison, there is no clear link between the level of urbanisation and GNI. In 1970, GNI was U.S.$ 250 at an urbanisation level of 29%. This increased to U.S.$ 340 in 1984 at urbanisation levels of 32%. However, almost two decades later, at urbanisation levels of 44% in 2000, GNI in Ghana had decreased to U.S.$ 270.

Table 4.5: GNI per capita vs urbanisation levels in Ghana, 1970-2010.

Census year	GNI per capita (U.S. $)	Urbanisation level (%)
1970	250	29
1984	340	32
2000	270	44
2010	1,230	51

Source: Cobinnah and Niminga-Beka (2017) as adapted from GSS Records (2012; 2013).

4.4.3 Discussion.

4.4.3.1 Trends in urbanisation and economic growth.

The findings presented in the previous sub-section provide supportive evidence for the pattern and nature of urbanisation in Ghana. Based on the numbers captured in Table 4.3, it is clear that urbanisation in Ghana has proceeded at a fast pace, a situation that has resulted in over half of Ghana's population living in urban areas (Cobbinah and Niminga-Beka 2017). Overall, between 1950 and 2010, Ghana's urban population had grown at an average annual exponential rate of 4%, increasing from 769,000 (15.44% urban) in 1950 to 12,492,000 (51.22% urban) in 2010. This resulted in the populations of its two biggest cities, Accra and Kumasi, hitting over 2 million each. While Ghana's urbanisation was either below or marginally on a par with global urbanisation rates between 1950 and 2010, critically, its future urbanisation level (72.33%) is projected to exceed the global level (67.18%) for the

period 2010 - 2050 (Cobinnah et al. 2015a). This highlights the enormity of the scale of urbanisation in Ghana.

As argued in Section 1.1.2, the relationship between urbanisation and economic growth in Africa remains an enigma, as it is not clear whether or not it always brings economic growth (Turok 2013). Published international and national statistics do not allow easy analysis of the contribution of individual urban areas to GNI per capita in Ghana. However, from the national statistics for Ghana, a comparison of the GNI per capita and urbanisation levels shown in Table 4.5 does not suggest any positive relationship between the two. This is because when GNI was U.S.$ 250 in 1970, urbanisation level was 29%. When GNI increased to U.S.$ 340 in 1984, urbanisation level was 32%. Subsequently when urbanisation level was 44% in 2000, GNI was U.S.$ 270. As such, while economic growth tends to be associated with urbanisation, urbanisation does not necessarily lead to economic growth, especially in the African case (Turok 2013). The idea behind this assertion is that there are independent or mediating forces which are critical to determining whether urbanisation will lead to equitable economic growth. At this stage, an important fact to note is the resource-dependent nature of the general economy in Ghana, which, like other African countries, is suggested not to be urban-oriented, but helps situate the relationship between Ghana's urbanisation and economic development within the context of why urbanisation in Africa does not necessarily result in economic growth or development (UNECA 2012a; Turok and McGranahan 2013). While it is recognised from the foregoing that GNI per capita in Ghana may or may not increase alongside urbanisation rates, at the very least, any discussion on the effect of urbanisation on urban economic development in the country will have to also recognise the prevalence of poverty, informality, and their impacts on the livelihoods of the urban populace. As shown in Section 4.2.1.3, endemic poverty and inequality resulting from wide-spread unemployment and informality are among the structural ills plaguing urban societies in Ghana (UNICEF 2012; World Bank 2015; Cooke et al. 2016). As much as the products of informality, including slum formation, may be due to poor urban management; the informal sector is an indispensable part of Ghanaian urban centres as it is crucial for employment creation, especially for migrants (Gillespie 2016). From Section 4.2.1.3, it is true that poverty levels in Ghana have reduced from 56% in the 1990s to 23% in 2013. However, it is also true that as of 2006, the wealthiest 20% of Ghanaians earned over half of Ghana's income, up from 44% in the 1990s; while at the same time, the poorest one fifth saw their share of national income reduce from 6.9% to 5.2%. Therefore, inferring from the review of urban challenges in

Ghana presented in Section 4.2. and the discussion so far, it may be argued that even when urbanisation has spurred economic growth, it is not a panacea for all urban economic challenges. The trends in Ghana's urbanisation and economic growth have, thus, justified why settlements in Ghana are becoming increasingly 'urban' in their outlook. Even when urbanisation should result in an economic growth scenario, an interplay of factors could lead to the creation of urban areas where there is inequality and poverty.

4.4.3.2 Driving forces of urbanisation in Ghana.

Given the rapid nature of the urbanisation in Ghana, it is important to understand the key driving forces underpinning the process. Based on the evidence presented in this section and the literature (see, for example, McGranahan et al. 2009; Jedwab et al. 2017), it can be argued that urbanisation in Ghana is driven by internal forces and exacerbated by external factors. These forces are inter-related, and in an increasingly globalised world, it is their synergistic effect that shapes the urbanisation phenomena in Ghana. The discussion on the driving forces of urbanisation in Ghana will, therefore, consist of two parts: 'internal forces' which will touch on factors such as population growth and rural-urban migration, and 'external forces' which covers issues such as globalisation. For this discussion, population growth, rural-migration and reclassification of settlements will be considered under the umbrella of 'demographic shifts'.

(a) Demographic shifts.

Synthesis of the findings shows that consistent with the literature (for example, McGranahan et al. 2009; Jedwab et al. 2017), the main demographic movements underpinning urbanisation in Ghana are natural population growth and rural-urban migration. A third force, 'reclassification', exists which in the view of this study is a product of natural population growth (McGranahan et al. 2009; Jedwab et al. 2017). The findings show that a greater majority (60%) of urban growth in Ghana between 1984 and 2010, is attributed to natural population growth; and the contribution of rural-urban migration to urbanisation was at an average of 40% between 1984 and 2010. The contribution of rural-urban migration to urbanisation in Ghana is dual. On a primary level, the mere movement of migrants from rural to urban areas contributes to urban growth. On a secondary level, the reproductive functions of rural migrants who become urban citizens also contribute to urban growth (Cobinnah et al. 2015a). Overall, the agglomeration effects due to the primacy of cities such as Accra and

Kumasi have ensured that alongside natural population growth, they have also expanded due to the inflow of migrants seeking better opportunities in life. For example, at an average annual growth rate of 5% (Oduro et al. 2014), Kumasi is the fastest growing big city in Ghana. Similarly, the increase in the distribution of urbanised towns has been fuelled by urbanisation and 'reclassification' of some previously rural populations through natural population growth and migration (McGranahan et al. 2009; Jedwab et al. 2017). Nevertheless, the regional differences in urbanisation evidenced in Table 4.4 show that urbanisation does not automatically manifest in the same spatial pattern, as other development factors might be at play. Looking at the trends overall, it is clear that demographic drivers have not only led to an increase in the total urban population, but have also led to an increase in the sizes of Ghana's biggest cities.

(b) Market forces.

Consistent with the notion of cities as hotspots of economic growth in an increasingly globalised world (Zhang 2016), the role of market forces in driving the urbanisation process in Ghana is critical. The Ghanaian economy is a mixed one, characterised by a gradual shift from a State-dominant economy to a market-led and liberalised one (see Obeng-Odoom 2012). Thus, the increases in GNI over the past decades (shown in Table 4.5), as a measure of economic performance, have come about from a combination of minimal State control of economic activities and increased private sector freedoms. In order to analyse the causal links of market forces on urbanisation in Ghana, they are discussed in terms of the supply and demand for land and housing, and labour. Inevitably, an increasingly urban population which results from the process of urbanisation triggers the conversion of land to meet the construction demand for residential and commercial properties, and other public goods such as transportation infrastructure. An important factor to consider in the scenario above is the availability of land to meet the demands of different stakeholders. Assuming that various stakeholders can freely compete for limited urban land resources, then realistically, this means that only private investors and wealthy individuals could afford to invest. The urban land market, thus, influences the urbanisation process by determining the spatial concentration of economic opportunities and infrastructural provisions. With a housing stock deficit of at least 1.7 million (Daily Graphic Online 2018), the land and housing markets also influence the spatial structure of urbanisation in Ghana. Rural-urban migration and natural population growth create a demand to provide more urban housing. Considering the lack of welfare housing provision and the generally weak planning enforcement, the bid to supply

the housing demand further drives the urbanisation process. This is because, with the State unable to supply affordable public housing, market actors become the determinants of new property locations (Daily Graphic Online 2018). They will attempt to achieve this by pursuing options that will extract the highest value from the land and offer maximum investment returns. For example, market actors could decide to undertake projects near locations with relevant opportunities and services. This means that more people could decide to move to such areas to enjoy these opportunities and services. The effect of this could be the creation of property portfolios which do not necessarily conform to the logic of planning frameworks and could potentially distort urban form.

The more liberalised nature of Ghana's economy enhances the creation and expansion of a free labour market (see, for example, Grant and Nijman 2002; Obeng-Odoom 2012). When considered together with rural-urban migration discussed above, it can be argued that urbanisation in Ghana is shaped by rural 'push' factors and urban 'pull' factors (Jedwab et al. 2017), although the focus here will be on urban 'pull' factors. The unrestricted movement of people into urban areas is in itself a market behaviour as the migration of people to cities is usually in response to the 'pull' factors, such as better employment opportunities and higher wages. This means that provided the perceived economic incentives for migrating into urban areas remain strong, urbanisation will proceed with the flow of people from rural to urban areas. Thus, the urbanisation process in Ghana is shaped by market forces through its coexistence and interaction with State mechanisms. Essentially, the reality that urbanisation in Ghana has outpaced planning provisions (Yeboah and Obeng-Odoom 2010), is indicative of the weakened State-control of how these market forces are unleashed in a more liberalised setting.

(c) Globalisation.

As was elucidated in the literature (see Section 2.2.4), globalisation connects national economies by facilitating the movements of goods, services, and people freely across borders. Considering how globalisation shapes the urbanisation process in Ghana requires an examination of the everyday construction of globalisation. The narratives of globalisation generally assume an in-flow of foreign direct investments that facilitate the mobility of capital, goods, services, and people. This in-flow, in turn, provides the foundations for the overall development of a country by inducing economic growth. Inevitably, a significant proportion of Ghana's GDP is derived from foreign direct investments. For example, mineral

resource exports contributed to over 7% of the country's GDP in 2011 (Akafia and Kuenyehia Sr. 2012). Moreover, as can be seen from Table 4.5, Ghana's GNI per capita increased from U.S.$ 340 in 1984 to U.S.$ 1,230 in 2010.

Practically, urbanisation due to globalisation tends to be in response to decisions taken at higher spatial levels (for example, at the national, regional or global levels). The manner through which globalisation drives urbanisation in Ghana can, therefore, be demonstrated with the following illustrations. At the global level, an investment decision by a Multi-National Corporation (MNC) to establish operations in Ghana generally leads to the migration of capital, technology, and people from across the world and also from within the country (as can be seen in population growth of areas which host these MNC operations) as more people arrive to take advantage of increased opportunities. Here, decisions made at the global headquarters of any particular MNC could have implications at the local level, including changes in the spatial structure of urbanisation. At the regional level, Ghana's membership of political associations such as the Economic Community of West African States (ECOWAS) facilitates the free movement of people, goods, and services across the borders of member countries. This, for instance, has implications for labour markets, and impacts the spatial characteristics of urban areas in member countries, as there is a potential for the influx of people from poorer countries into the urban areas of relatively wealthier countries, in response to economic conditions.

4.4.4 Sustainability implications of urbanisation in Ghana.

Central to the current discussion on urbanisation in Ghana is the implication of the country's urbanisation process for the achievement of sustainability goals. As has been implied by the previous findings and discussions, urbanisation is not only premised on economic factors but also social and environmental factors (Cobbinah et al. 2015a). Therefore, the sustainability of urban areas is about pursuing economic growth while protecting the integrity of the environment and improving social equity. Interwoven with the perception of modern living, an increasingly urban population will stimulate a shift in lifestyle choices from rural to urban, thereby resulting in increased resource use, increased energy use, and increased car dependency, etc. Inferring from the urban challenges facing Ghanaian urban areas (as presented in Section 4.2), and taking into consideration the less-developed status of Ghana, it is clear that rapid urbanisation in Ghana would potentially exacerbate these challenges. For

example, increased car dependency could affect the health of the urban population and the environment due to air pollution. This makes it imperative to discuss whether the urbanisation process in Ghana has proceeded in a manner consistent with the principles of sustainable development, and in ways that assure a reasonable quality of life for Ghana's urban citizens. This is not an attempt to highlight only the 'negatives' of the urbanisation process in Ghana, but rather to reinforce the idea that a well-managed urbanisation process is crucial to the achievement of the country's broader SD goals.

From an economic perspective, globalisation and market liberalisation are increasingly shaping the fundamentals of urbanisation in Ghana. Critically, under the conditions of a liberalised economy, market forces could distort the urbanisation process in a way that threatens the economic foundations of urban areas. For example, there is an inevitable possibility of change in the actors who control and regulate the use of vital resources such as land from local communities into the hands of market actors. This potentially makes market forces determinants of the spatial concentration of vital opportunities and services. Such a situation will have a spill-over effect on the nature of urbanisation. The free labour market created by the liberalisation of State-control in Ghana means that rapid urbanisation due to rural-urban migration could lead to an over-supply of urban labour as the rate of migrant-flow into urban areas could exceed the rate of urban job creation. This could exacerbate the already precarious urban unemployment situation (see Section 4.2.1.2) and deteriorate the quality of employment in Ghana. Furthermore, as elaborated earlier, globalisation could spur economic growth due to the inflow of foreign direct investments. This helps drive urbanisation as people move to areas of investment in search of better opportunities in life. For Ghana, FDI investments typically come in the form of MNC investment in the extraction of natural resources. The implications for economic sustainability, and by extension overall sustainability, is the risk of dependency on such investments (see Section 2.6.1.2). This is because there is a likelihood that MNCs will prioritise their profits and shareholders' interests. Therefore, in the event of decreasing profits, MNCs could respond by halting operations, withdrawing entirely, or moving to areas where more favourable conditions exist. This could have severe implications for urban areas whose local economies are heavily dependent on the operations of such MNCs (UNECA 2012a; Turok and McGranahan 2013). A typical example in Ghana is the case of Obuasi Municipality, which has hosted the mining operations of AngloGold Ashanti for over a century. The existence of the mining company means that Obuasi became highly urbanised, as it attracted a variety of people seeking

improved life opportunities. However, until its redevelopment and reopening in 2019, the operations of the company in Obuasi had been irregular since 2014, leading to the retrenchment of mine workers and reduced life opportunities for the municipality's citizens (Ghana Chamber of Mines 2019). Thus, for an urban area such as Obuasi, which is characteristically a resource-based city, rapid urbanisation in an increasingly globalised world is a double-edged sword in the context of sustainability.

From a social perspective, the urbanisation process could enhance sustainability in urban areas in Ghana. For instance, the lobbying power wielded by urban elites and the urban bias tendencies (Lipton 1977) could lead to the provision and improved access to relevant social infrastructure, including education and transportation. Again, for marginalised groups such as women living in rural areas, for whom access to certain opportunities may be limited or non-existent, urbanisation represents a pathway for increased access to an array of opportunities including education, employment, and participation in politics. Nevertheless, the discussions in the previous sections also demonstrate that the combination of endogenous market forces and the exogenous force of globalisation which underpins the urbanisation process could polarise wealth and resource utility which could, in turn, threaten social sustainability. Such polarisation effects could lead to sharp divisions in urban societies, as deepened inequalities could threaten social harmony. Also, as mentioned earlier, the Ghanaian economy significantly depends on the extraction and export of natural resources, which are generally controlled by foreign corporations. Therefore, depending on the nature of FDIs and the behaviour of their actors, globalisation could drive urbanisation in ways that either contribute to poverty and inequality or alleviate them. For example, the arrival of a major global investor could lead to the forced relocation of a section of an urban population. For some, this might constitute a direct threat to their source of livelihoods. Viewed from another angle, the corporate social responsibility (CSR) initiatives of corporations which sometimes involve alternative livelihood programmes could help alleviate poverty and help protect vulnerable groups. However, although not in the scope of this thesis, it is important to mention that more often than not, these programmes have had minimal impact on alleviating the plight of the poor, as the poor are primarily denied access to natural resources which hitherto were available to them (see for example, Opoku-Mensah and Asare-Okyere (2014).

The quest for overall urban development, in the contexts of neo-liberal economies, could result in side-stepping environmental concerns as socio-economic development is pursued.

From an environmental perspective, population growth due to urbanisation in Ghana could generate substantial challenges to the ecological integrity of urban environments due to the tendency of neo-liberal systems to ignore environmental realities (see Le Gales 2016). Accordingly, in mainstream thinking, urbanisation is generally seen as a driver of environmental impacts (Grimmond 2007; Parnell et al. 2007). In Ghana, the urban challenges explicated in Section 4.2 typify the extent to which the environmental sustainability of urban areas could be compromised. For example, population growth due to urbanisation and its attendant change in consumption patterns could lead to more waste being generated, compounding the already significant waste management challenges facing urban areas in Ghana. Weak land use controls also increase the likelihood of the unscrupulous conversion of protected areas and agricultural land, on which many flora and fauna may depend, into residential and commercial areas (see Le Gales 2016). This is consistent with the position advanced by Redclift (2005) that less-developed nations could potentially prioritise socio-economic development even at the expense of ecological integrity. On a positive note, however, a well-directed urbanisation process has the potential to mitigate environmental implications. For example, with the needed political will and requisite capacity, Ghana could positively manage the environmental implications of contemporary urbanisation by retrofitting existing urban areas and building new ones based on approaches that are consistent with sustainability principles. In such a scenario, approaches which promote compactness, for example, are likely to lead to shorter commuting distances which will, in turn, reduce air pollution (see Table 2.1).

In sum, the rapid pace of urbanisation in Ghana and the scale of urban challenges imply that the Government cannot adequately manage the process in a manner that is consistent with sustainability goals (relative to available resources). Accordingly, the liberal economic posture assumed by the State means that more and more urban needs are left to private sector provision (see Obeng-Odoom 2012; Leon 2015; Le Gales 2016). The effect of which could be a fragmented urbanisation process which undermines distributive equity, creates pernicious environmental impacts, and threatens wider sustainability goals. The discussions above have considered only some of the important implications of Ghana's urbanisation on the sustainability of its urban areas. The complex and bi-directional relationship between urbanisation and sustainability means that urbanisation underpins many factors that will determine the sustainability of urban areas in Ghana. While these have been explicated from social, economic, and environmental perspectives, no single perspective dominates as the

relative degree to which each dimension of sustainability is affected depends on dynamic local conditions. However, taken together, they set the context in which the sustainability of Ghana's urban areas may be affected by rapid urbanisation and stimulate a rethinking of how urban areas are managed.

Chapter Five

5. Urbanisation and sustainable development in Ghana: comparative case studies in Kumasi and Obuasi.

5.1 Introduction

This chapter presents the findings of the comparative sub-case-study on two urban areas in Ghana (Kumasi and Obuasi) selected to explore the interactions between urbanisation and sustainable development at the urban spatial level. This strategy was chosen because of the complexity of the inter-relations between the phenomena mentioned above at the local urban level which is, possibly, best understood through case-based investigation (Yin 2003). The rest of the chapter consists of four sections and proceeds as follows. The first three sections consider the urbanisation-sustainability link by focusing on i) demographic and landscape urbanisation in the two areas and their implication for sustainability; ii) the assessment of selected socio-economic indicators related to sustainability; and iii) the subjective experience of citizens in the two urban areas through a survey. The fourth section provides an integrated discussion on the findings in Sections 5.2–5.4.

5.2 The sustainability implications of landscape and demographic urbanisation in Kumasi and Obuasi

5.2.1 LULC Characterisation

The overall accuracies of the land cover maps were above 80%, and the Kappa coefficients ranged between 0.76 and 0.86 (see Appendix 4) with the exception of Obuasi 2010 (Table A4.7, Appendix 4), which imply that the greater majority of image classifications were of sufficient quality (Anderson et al. 1976). The lower overall accuracy and Kappa coefficient recorded for Obuasi 2010 (Table A4.7, Appendix 4) is attributable to classification error due to possible spectral mixing caused by overlap in land cover types such as ‘mixed woody vegetation’ and ‘forest’, potentially resulting in mixed-pixel problems which undermined separation of these areas in the imagery.

The maps of LULC classes for Kumasi in 1986, 2000, 2010, 2018 are shown in Figures 5.1 - 5.4, and the corresponding LULC statistics are shown in Table 5.1. Taken together, Figures 5.1–5.4 and Table 5.1 show that 'mixed wood vegetation' (77%) was the dominant land cover type in Kumasi in 1986. However, by 2018, urban expansion had led to the dominance of 'built-up' land cover (62.5%), at the expense of the other land cover classes. Overall, the land cover change in Kumasi within the study period could be characterised as one which is dominated by urban expansion, and the loss of agricultural land and forest. There was conversion of mixed woody vegetation to agricultural land, then onto urban or built-up. However, evidence of the conversion of some agricultural land to mixed woody vegetation or forest during 2010–2018 may be possible signs of sustainability or conservation strategies.

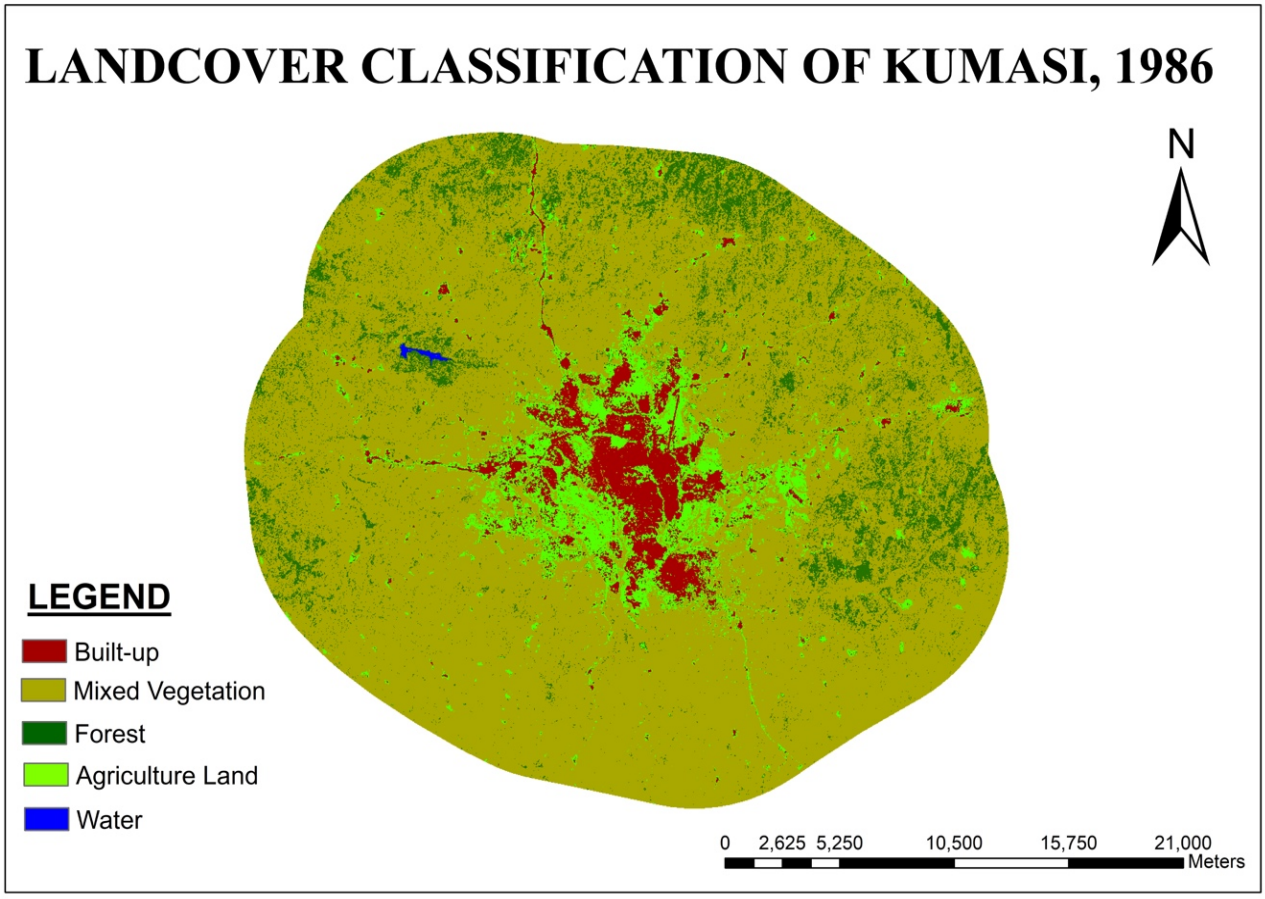

Figure 5.1: Land cover classification of Kumasi, 1986.
Note: Mixed woody vegetation is represented in the legend as 'Mixed Vegetation'.

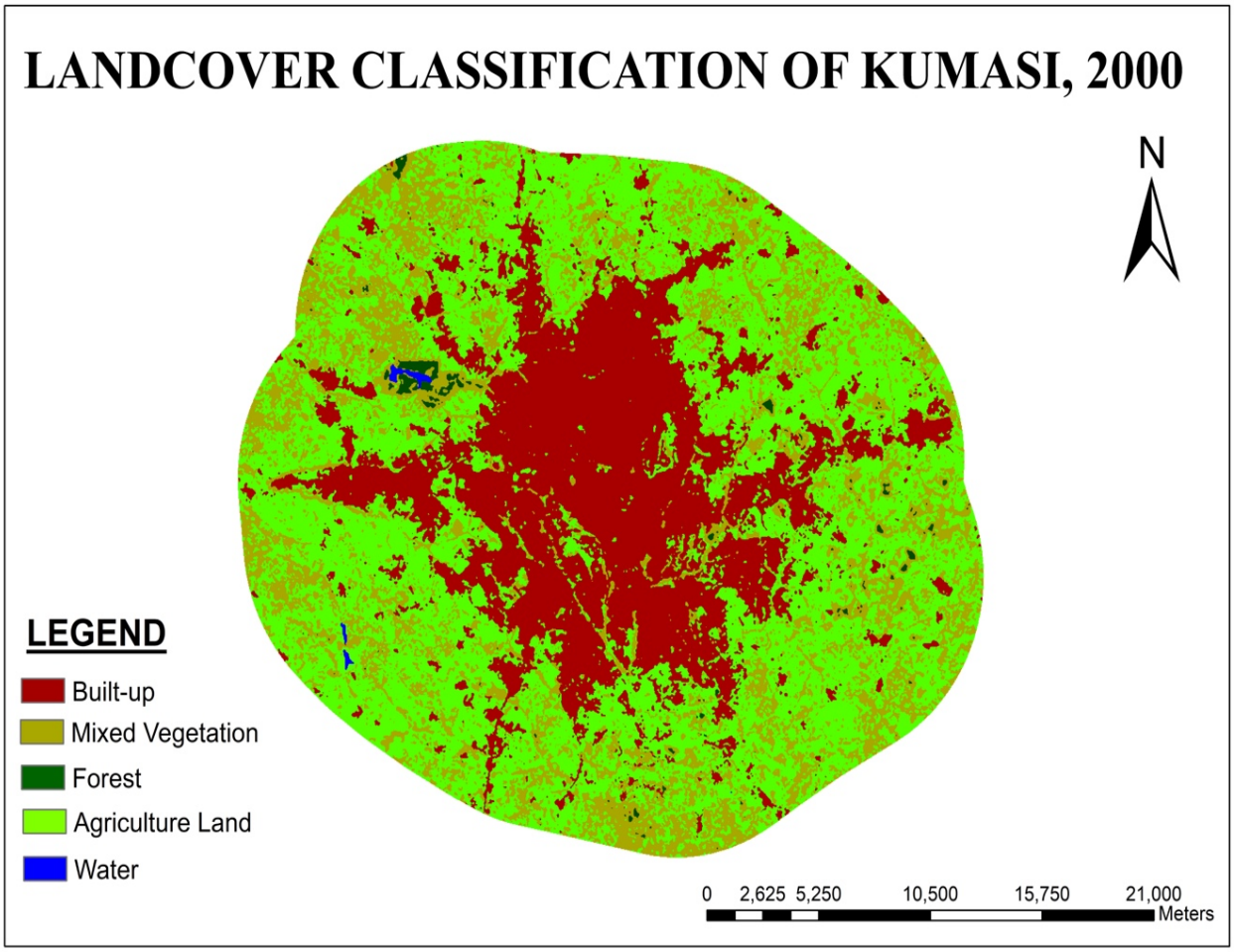

Figure 5.2: Land cover classification of Kumasi, 2000.
Note: Mixed woody vegetation is represented in the legend as 'Mixed Vegetation'.

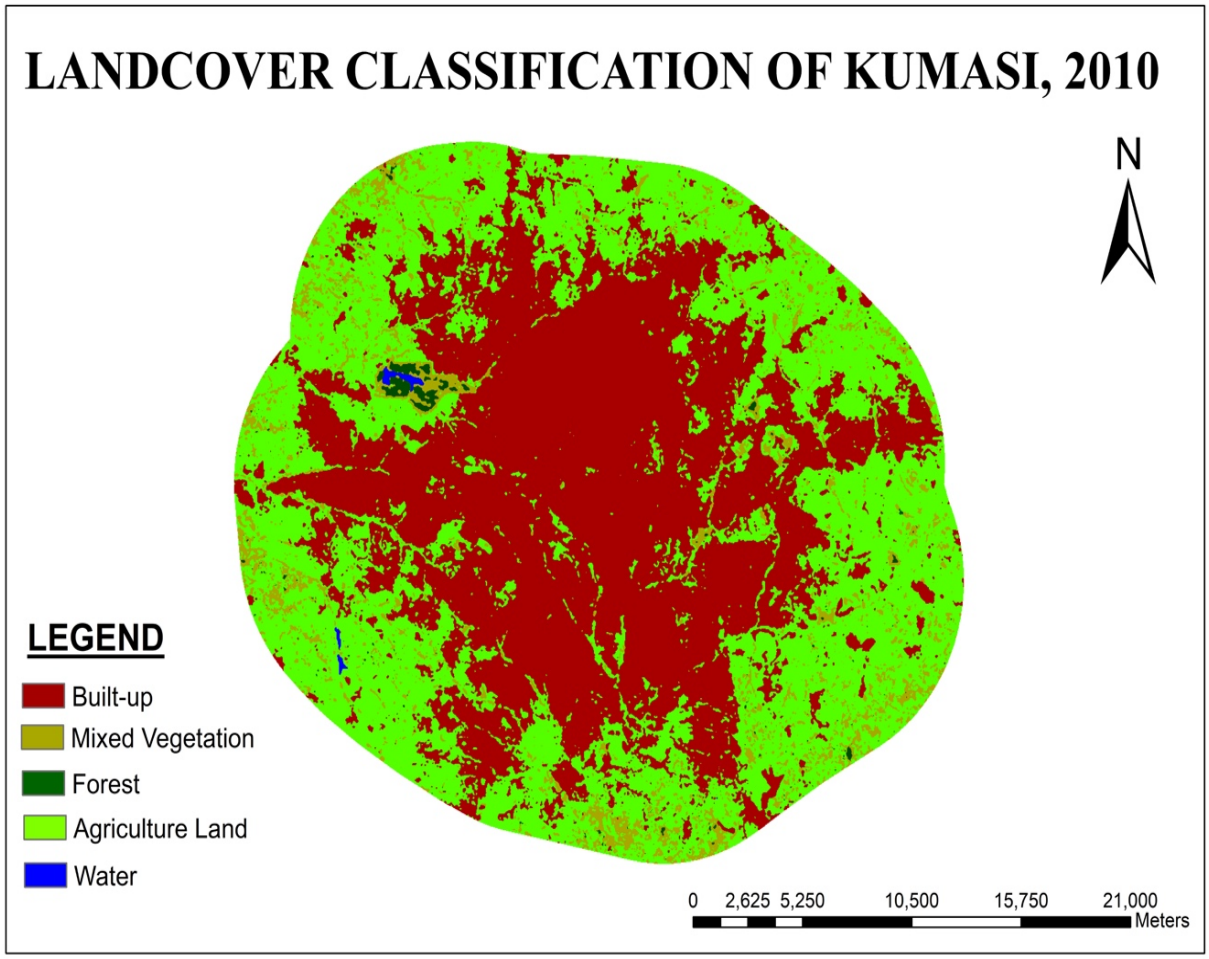

Figure 5.3: Land cover classification of Kumasi, 2010.
Note: Mixed woody vegetation is represented in the legend as 'Mixed Vegetation'.

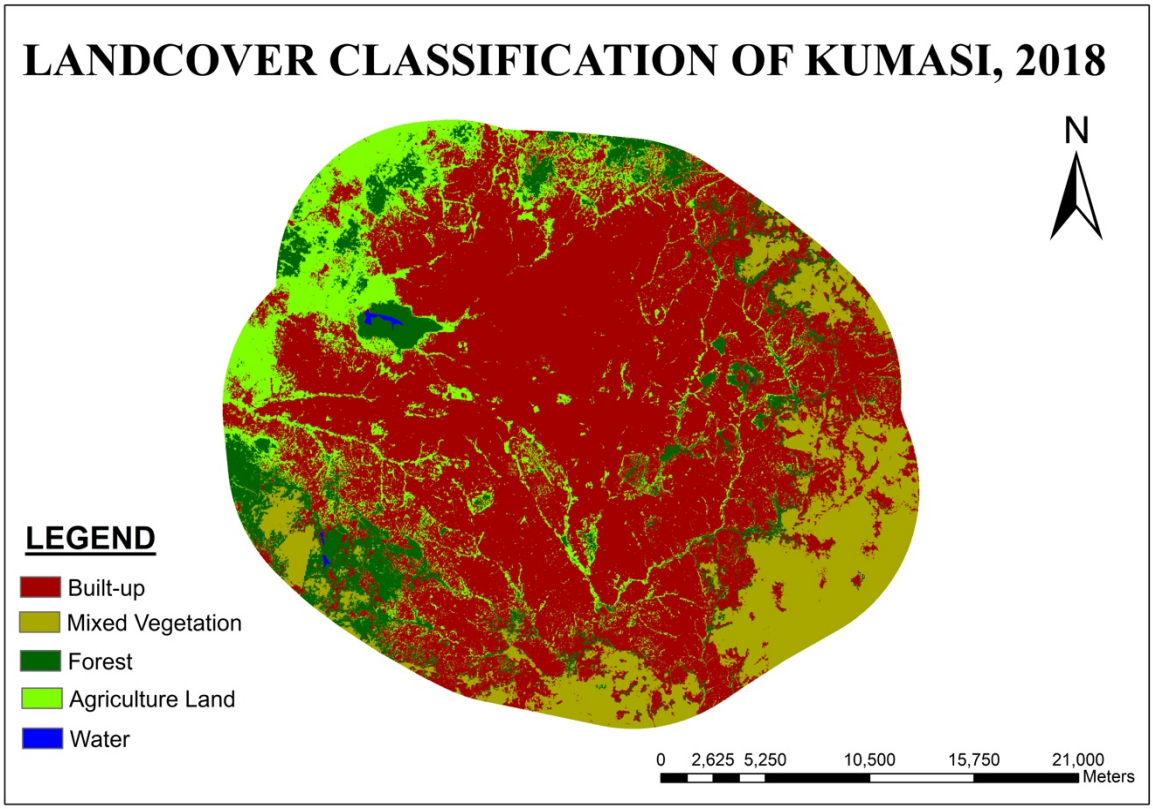

Figure 5.4: Land cover classification of Kumasi, 2018.
Note: Mixed woody vegetation is represented in the legend as 'Mixed Vegetation'.

Table 5.1: LULC characteristics in Kumasi (1986-2018)

LULC Classes	Area Coverage (km^2)				Changes in area (%)			
	1986	**2000**	**2010**	**2018**	**1986-2000**	**2000-2010**	**2010-2018**	**1986-2018**
Built-Up	43.23	232.92	390.23	509.20	438.79	67.53	30.50	1105.77
Agricultural Land	64.75	400.71	373.96	118.55	518.85	-6.68	-68.30	83.00
Mixed Woody Vegetation	628.76	176.34	46.57	113.35	-71.95	-73.59	143.39	-81.97
Water Body	0.50	0.96	0.96	0.67	92.00	0.00	-30.20	34.00
Forest	78.11	4.42	3.63	73.58	-94.34	-17.87	1924.51	-5.91
Total	**815.35**	**815.35**	**815.35**	**815.35**				

For Obuasi, Figures 5.5–5.8 represent the thematic maps for its spatio-temporal LULC classes in 1986, 2000, 2010, and 2018 respectively, while Table 5.2 provides the corresponding LULC statistics. The land cover types observed in Obuasi varied slightly from Kumasi as it is a historic gold mining area. From Figures 5.5–5.8 and Table 5.2, it is evident that land cover in Obuasi was dominated by 'mixed woody vegetation' (42.5%) in 1986. However, by 2018, 'agriculture' land (33.3%) had moved ahead of 'mixed woody vegetation' (30.9%) as the dominant land cover type in Obuasi. Crucially, 'built-up' land cover increased from 6.2% in 1986 to 15.2% in 2018. Therefore, while not dominant, 'built-up' land cover increased significantly due to urbanisation. Overall, the land cover characteristics in Obuasi during the study period could also be characterised as one which is dominated by urban expansion, increase in mining land, and loss of natural vegetation (agricultural land, mixed woody vegetation and forest). However, aside from the transition from mixed woody to agricultural and onto urban / built- up, the LULC patterns in Obuasi were not so obvious as some other land classes fluctuated (for example, bare ground) between dates (possibly due to classification error).

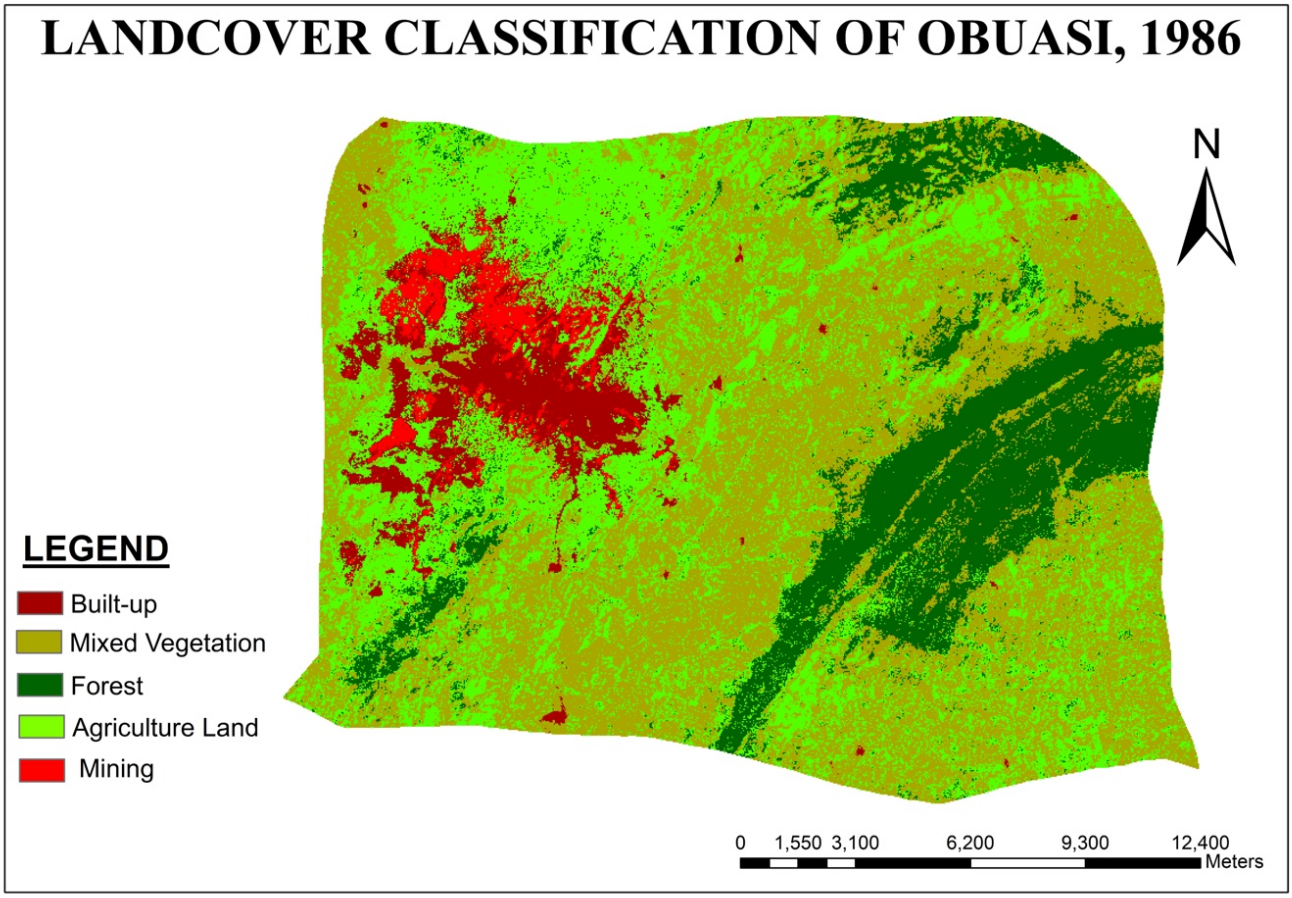

Figure 5.5: Land cover classification of Obuasi, 1986.
Note: Mixed woody vegetation is represented in the legend as 'Mixed Vegetation'.

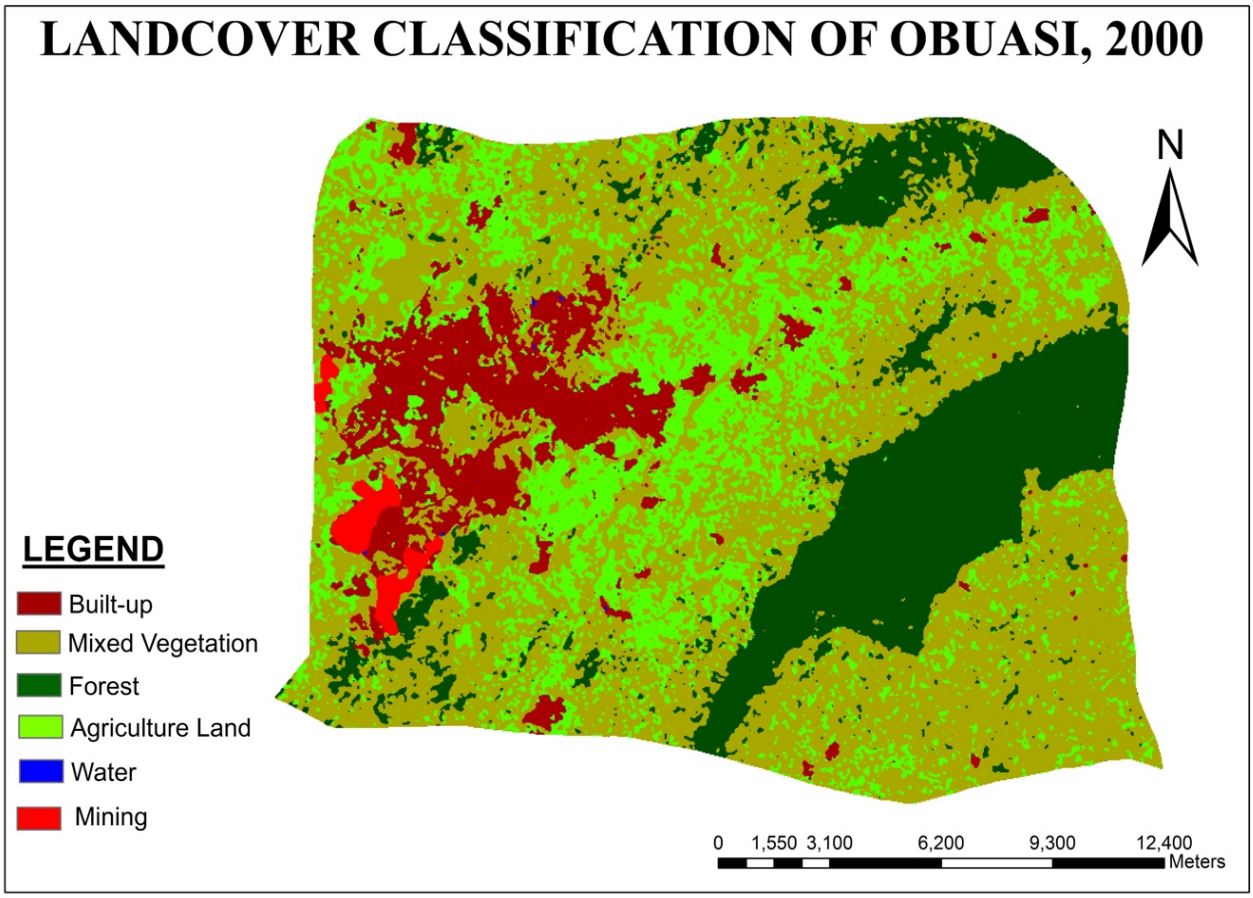

Figure 5.6: Land cover classification of Obuasi, 2000.
Note: Mixed woody vegetation is represented in the legend as 'Mixed Vegetation'.

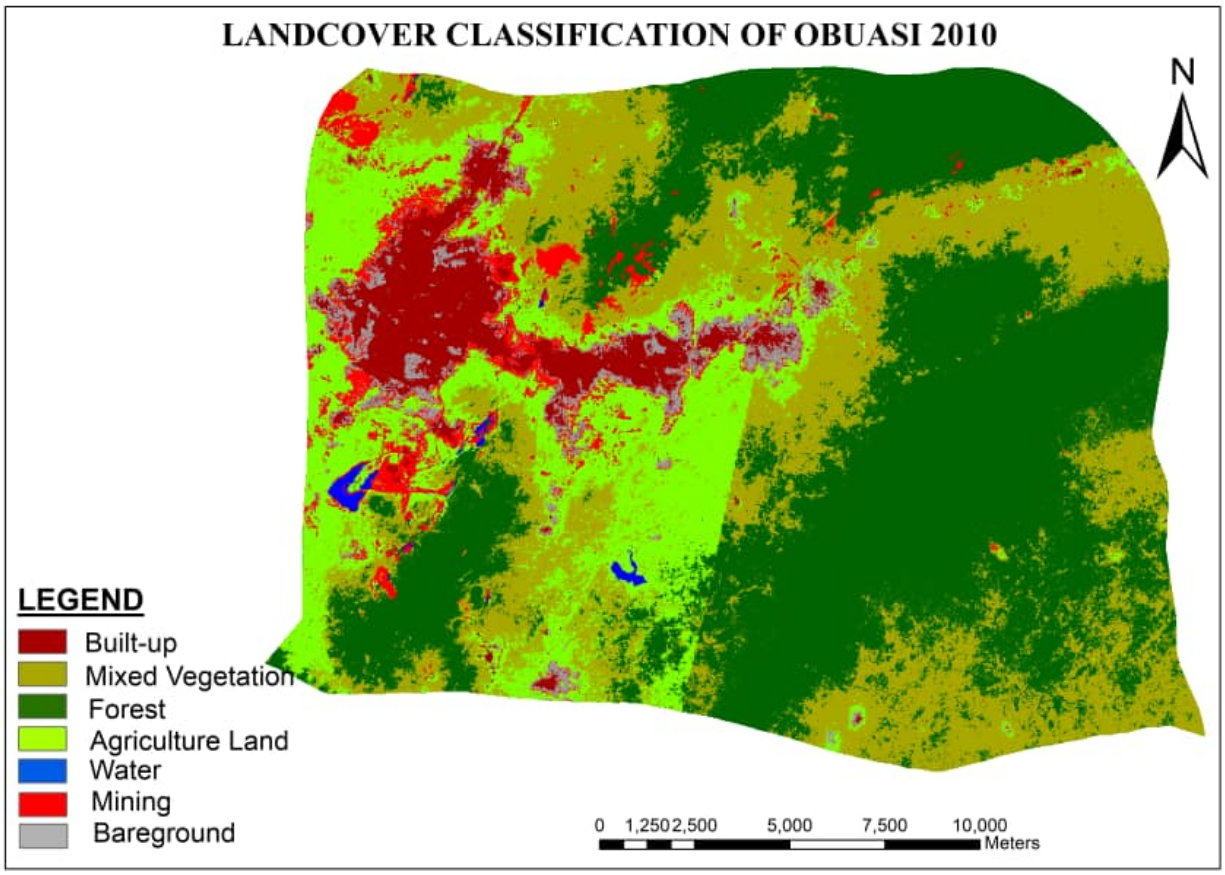

Figure 5.7: Land cover classification of Obuasi, 2010.
Note: Mixed woody vegetation is represented in the legend as 'Mixed Vegetation'.

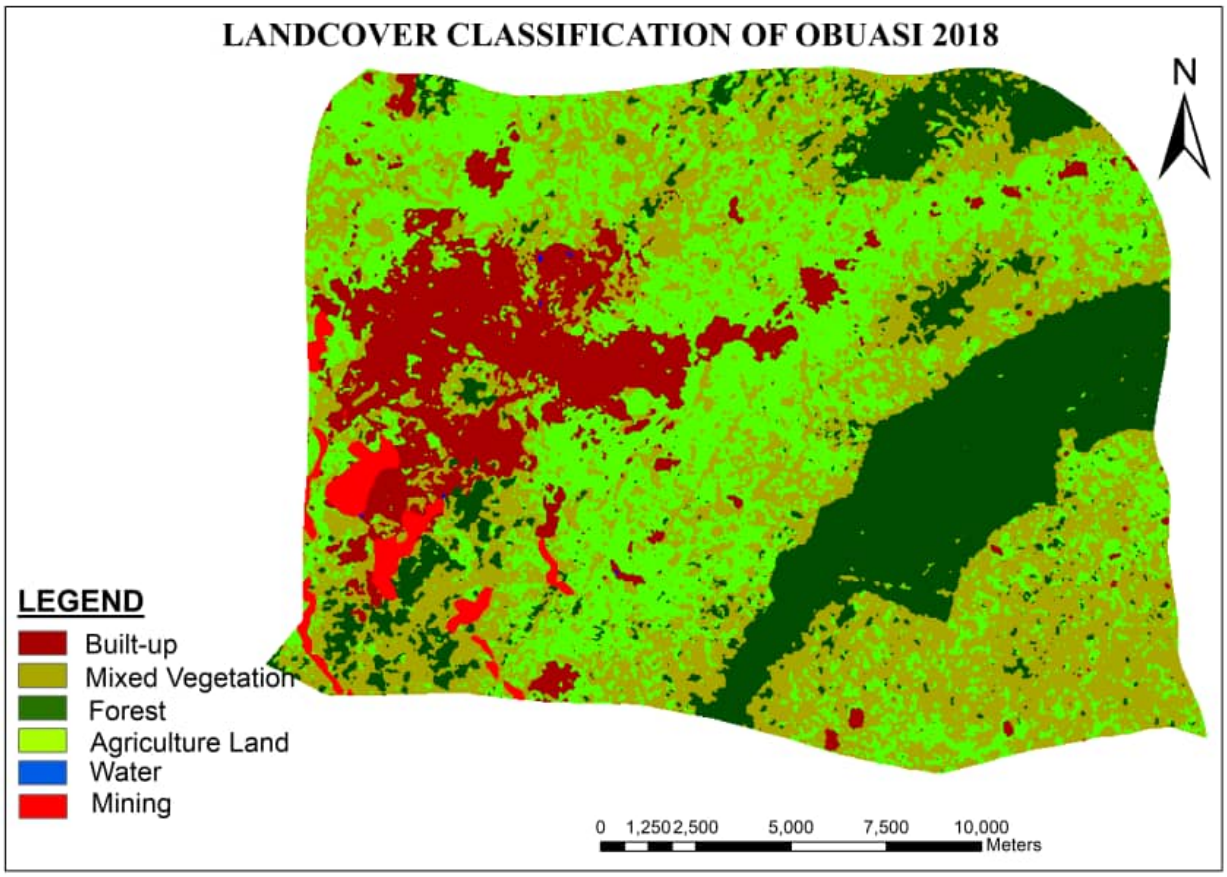

Figure 5.8: Land cover classification of Obuasi, 2018.
Note: Mixed woody vegetation is represented in the legend as 'Mixed Vegetation'.

Table 5.2: LULC characteristics in Obuasi (1986-2018).

LULC Classes	Area Coverage (km^2)				Changes in area (%)			
	1986	**2000**	**2010**	**2018**	**1986-2000**	**2000-2010**	**2010-2018**	**1986-2018**
Built-Up	23.60	36.62	46.50	57.68	55.16	27	24	144.40
Agricultural Land	126.64	80.13	110.03	126.83	-36.72	37.31	15.27	0.15
Mixed Woody Vegetation	161.56	189.41	76.06	117.52	17.31	-59.84	54.51	-27.26
Forest	58.16	70.08	119.04	71.55	20.49	69.86	-39.89	23.02
Water Body	-	0.07	1.20	0.07	-	1614	94.17	-
Bare ground	-	-	11.15	-	-	-	-	-
Mining	10.55	4.20	16.53	6.86	-60.19	293.57	-58.5	-34.98
Total	**380.51**	**380.51**	**380.51**	**380.51**				

Note: '-' is placed where a land cover is not identified on the image for a particular year.

5.2.2 Landscape urbanisation: Kumasi *vs* Obuasi.

For ease of comparison, especially in the context of urban expansion, a different set of land cover maps (See Appendix 6) was produced in which the land cover types were reduced to two classes (built-up and non-built-up). The statistics on the land cover maps in Appendix 6 are shown below in Table 5.3. The table shows that between 1986 and 2018, Kumasi's built-up land cover expanded by over 1,105%. Within the same period, the built-up share of Obuasi's land cover expanded by over 144%. In terms of exchanges or transfers between the different land cover types, the LULC change matrices (attached in Appendix 5) show that in both Kumasi and Obuasi, built-up or urban land cover was the most significant gainer, usually at the expense of natural land cover. Subsequently, the thematic maps in Appendix 6 were combined in order to produce maps that show the overall extent of landscape urbanisation in Kumasi and Obuasi over the study period as shown in Figure 5.9 and Figure 5.10 respectively. Overall, the spatial extent of land cover types over the thirty-two years

study period is a clear indication that urban development has replaced and eroded into surrounding natural vegetation and non-urban land cover types in Kumasi and Obuasi. Essentially, the application of remote sensing has proved to be an effective method for examining and understanding the LULC characteristics or landscape transformation in Kumasi and Obuasi.

Table 5.3: Built-up vs Non-Built-up land cover in Kumasi and Obuasi, 1986 - 2018.

Location	LULC Classes	Area Coverage (km^2)				Changes in area (%)			
		1986	**2000**	**2010**	**2018**	**1986-2000**	**2000-2010**	**2010-2018**	**1986-2018**
Kumasi	Built-Up	43.23	232.92	390.23	509.20	438.79	67.53	30.50	1105.77
	Non-Built-up	772.12	582.43	425.12	306.15	-24.57	-27.00	-28.00	-60.35
	Total	**815.35**	**815.35**	**815.35**	**815.35**				
Obuasi	Built-Up	23.60	36.62	46.50	57.68	55.16	27	24	144.40
	Non-Built-up	356.91	343.89	334.01	322.83	-3.65	-2.87	-3.35	-9.55
	Total	**380.51**	**380.51**	**380.51**	**380.51**				

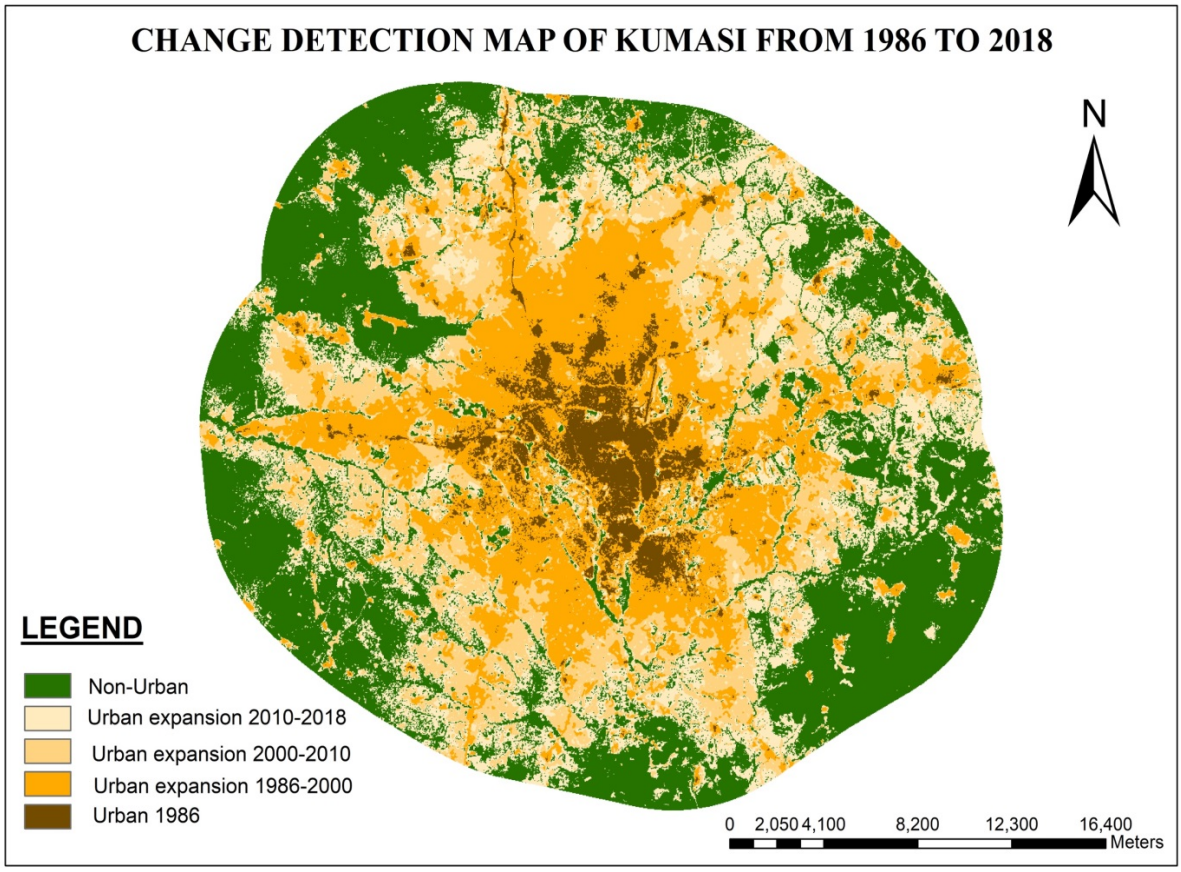

Figure 5.9: Land cover change detection map for Kumasi, 1986 - 2018.

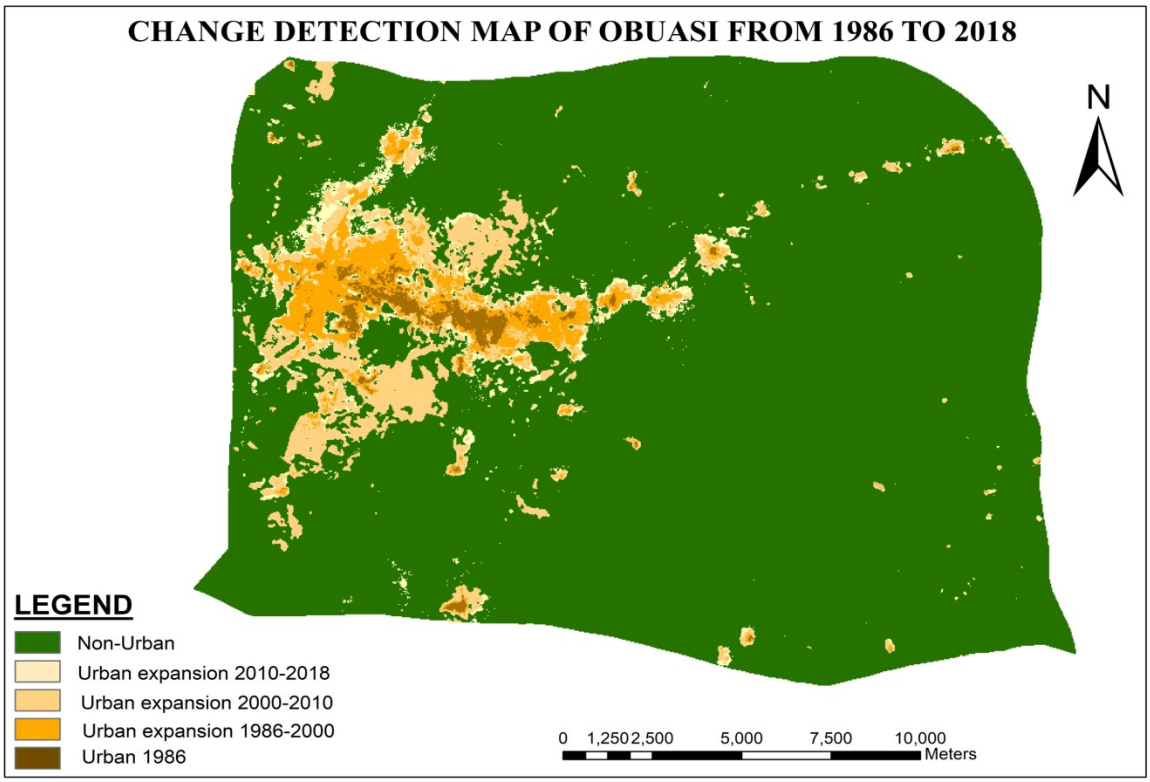

Figure 5.10: Land cover change detection map for Obuasi, 1986 - 2018.

5.2.3 Demographic urbanisation: Kumasi *vs* Obuasi.

The demographic data of Kumasi and Obuasi over the study period are presented in Table 5.4. It is worth noting that the years for which population statistics were available do not precisely correspond to the dates on which satellite data were captured due to gaps in published data, but for discussion purposes reference will be made to the closest dates possible. From Table 5.4, it is shown that the populations of both Kumasi and Obuasi expanded at least three times between 1984 and 2019. In terms of the rate of population growth, both Kumasi (14.81%) and Obuasi (11.94%) experienced the highest average annual rate of population change during the 1984-2000 intercensal period. The lowest average annual rate of change in Kumasi (2.41%) was recorded for the period 2010–2019, while Obuasi (2.43%) recorded its lowest annual rate of change between 2000 and 2010.

Table 5.4: Population statistics for Kumasi and Obuasi.

Location	Population				Average Annual Changes in Population (%)		
	1984	2000	2010	2019	1984-2000	2000-2010	2010-2019
Kumasi	496,628	1,170,270	1,730,249	2,105,382	14.81	4.79	2.41
Obuasi	60,617	115,564	143,644	203,554	11.94	2.43	4.63

Source: Ghana Statistical Service (2019).

Based on available data, the migration statistics measured by 'birthplace of dwellers' for Kumasi and Obuasi recorded from Ghana's 2010 Population and Housing Census are presented in Figure 5.11. From Figure 5.11, the migrant proportion of Kumasi (54%) is higher than recorded for Obuasi (37%). However, the proportion of migrants born outside the Ashanti region in each area is relatively higher in Obuasi (54%) when compared with Kumasi (38%).

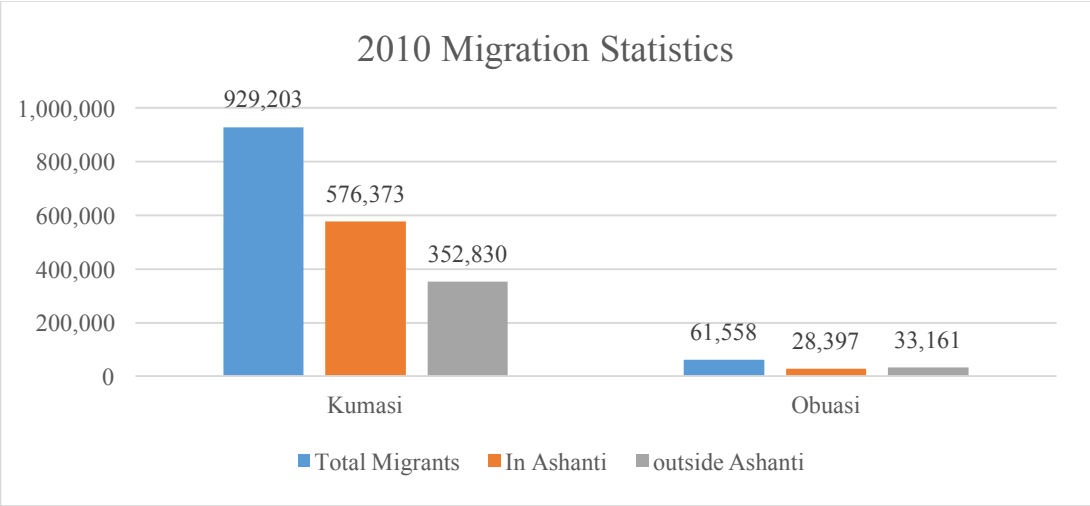

Figure 5.11: Migration statistics for Kumasi and Obuasi, 2010.
Source: Ghana Statistical Service (2014b; 2014c).

5.2.4 Population density in Kumasi and Obuasi

The population density figures for Kumasi and Obuasi are presented in Table 5.5. The table shows that population density in Kumasi decreased from 11,491 people / km^2 in 1984 / 1986 to 4,135 people / km^2 in 2018 / 2019. In Obuasi, the population density increased from 2,569 people / km^2 in 1984 / 1986 to 3,529 people / km^2 in 2018 / 2019. The sustainability implications of the changes in population densities in Kumasi and Obuasi are discussed in Section 5.2.5.4.

Table 5.5: Population density (number of people/ km^2) in Kumasi and Obuasi.

	Kumasi			**Obuasi**		
	Built-up area (km^2)	**Population**	**Pop. Density (mean)**	**Built-up area (km^2)**	**Population**	**Pop. Density (mean)**
1984/1986	43.22	496,628	11,491	23.60	60,617	2,569
2000	232.92	1,170,270	5,024	36.60	115,564	3,156
2010	390.23	1,730,249	4,434	46.50	143,644	3,089
2018/2019	509.20	2,105,382	4,135	57.68	203,554	3,529

5.2.5 Discussion.

5.2.5.1 Demographic urbanisation in Kumasi and Obuasi.

Contemporary demographic trends in Kumasi and Obuasi reflect the changes that have taken place in Ghana's demographic landscape over the last few decades resulting in over half of Ghana's population living in urban areas since 2010 (Cobinnah and Niminga-Beka 2017). As with other aspects of the demographic shift in Ghana, Table 5.4 has shown the remarkable changes in demographics in the study sites. From the evidence presented in Table 5.4, both Kumasi and Obuasi experienced increases, as Kumasi's population quadrupled and Obuasi's population tripled between 1984 and 2019. Consistent with the drivers of population growth identified in the literature, demographic urbanisation in the study areas is attributed mainly to natural population growth and migration (McGranahan et al. 2009; Jedwab et al. 2017). The migration data presented in Figure 5.11 confirms this, with the migrant proportion of Kumasi and Obuasi being 54% and 37% of their respective total population in 2010.

Among other possible reasons, a cogent explanation to describe the pattern of relative differences in demographic urbanisation in Kumasi and Obuasi is succinctly captured in the literature on urbanisation and economic growth in the African context (See Section 1.1.2). Accordingly, from the findings, two observations are made. First, while both areas experienced rapid population growth, that of Kumasi was higher in magnitude as its population quadrupled within the study period when compared with Obuasi whose population tripled. Second, the proportion of migrants in Kumasi's population was higher (54%) as compared with Obuasi (38%). Thus, using the proportion of migrants as a yardstick, it can be argued that Kumasi is potentially more economically-attractive to migrants than Obuasi. The simple explanation for this assertion is the potential for Kumasi's primacy in the region to derive the needed political and financial influence to attract people and services by offering relatively more opportunities for improved life, including improved access to urban services. In contrast, the local economy of Obuasi is primarily based on the mineral extraction activities of the gold mining giant AngloGold Ashanti. As a result, Obuasi's urbanisation process has been fundamentally shaped by the movement of people seeking to improve their livelihoods by exploiting the potential prosperity that the resource extraction operation offers in terms of job creation and enhanced urban infrastructure. However, with the down-turn in operations of the company (Ghana Chamber of Mines 2019), the capacity of the local economy to create and support jobs and wealth opportunities, a key attraction for migrants, has been potentially compromised. Therefore, on balance, Obuasi's population growth is currently more about natural population growth rather than through migration. Accordingly, from the findings in Table 5.4, Figure 5.11, and the discussion so far, it can be argued that Kumasi is more urban and more attractive to migrants than Obuasi. Consistent with the literature on urban bias discussed in Chapter Two, there is a heavy systematic bias that skews resource allocation in favour of urban residents (see, for example, Lipton 1977). The impact of urban-biased policies, thus, becomes more profound resulting in an increase in rates of urbanisation as cities expand to accommodate more people who want to enjoy the enhanced provision of public goods (Majumdar et al. 2004). Furthermore, the findings have demonstrated how the prevailing urban economic circumstances have shaped the contribution of natural population growth and migration to the demographic shifts observed in Kumasi over the study period. This is consistent with the arguments of Ferguson (1999) who suggests that population urbanisation should be conceptualised as two distinct and independent processes of natural population growth and migration for which the likelihood of either becoming the most important component of urbanisation is primarily determined by the

prevailing economic conditions. In sum, it is evident from the findings that the overall nature of demographic urbanisation in Kumasi and Obuasi were quite typical when considered in the context of observed patterns and identified leading causes of urbanisation discussed in Chapters One and Four; and consistent with the literature (see, for example, Ferguson 1999; David and Arman 2014), the urbanisation processes in the two areas have been fundamentally shaped by the prevailing economy.

5.2.5.2 Sustainability implications of demographic urbanisation in Kumasi and Obuasi.

With the results provided and discussed so far in relation to demographic urbanisation, a key question concerns the implications of the observations for sustainable development in Obuasi and Kumasi. As shown in Table 5.4, the urban growth in the areas under consideration provides local-level evidence of the ongoing rapid urbanisation in Ghana that has resulted in over half of the Ghanaian population living in urban areas since 2010 (Cobbinah et al. 2015a). While the combined population of Kumasi and Obuasi is roughly 7% of the overall national population (which is estimated at circa 30 million people), they are two of the ten biggest urban areas in Ghana (Ghana Statistical Service 2019). Thus, the scale of demographic shift presented in Table 5.4 for the two cities is both intriguing and also pinpoints to the extensive challenges faced by managers of Kumasi and Obuasi in relation to urban transition (see Section 4.2). For Kumasi, it is intriguing because of the uncertainty of having to deal with the fastest-growing urban area in Ghana, at 5% per annum (Oduro et al. 2014). For Obuasi, it is intriguing because of the uniqueness of its urbanisation process which has mainly been shaped by the resource extraction activities of AngloGold Ashanti and the recent down-turn of the company's operations (Ghana Chamber of Mines 2019). Overall, for both areas, it is intriguing because it presents unique opportunities to modernise, and in an increasingly globalised world, to transform into model cities that epitomise 21st century urban living in Ghana and by extension, SSA.

In the context of challenges, however, it has been argued that rapid urbanisation in Ghana has complicated the government's capacity to provide essential infrastructural and social services (Farvacque-Vitkovic et al. 2008; Okeke 2014) and the review of urban challenges in Ghana in Section 4.2 backs this argument. Therefore, from an economic perspective, rapid demographic urbanisation has implications for economic development in Kumasi and Obuasi (which are the two most populous centres in the Ashanti Region). While the high number of

migrants in both Kumasi and Obuasi is evidence of the attraction, power, and opportunities that both urban areas offer, an inevitable challenge will be how to engage all of these people in an economically productive manner that enhances their prospects for a better future. As already highlighted in Chapter One, a World Bank Report (2000, p.130) noted that *"Africa's pattern of 'urbanisation without growth' is in part the result of distorted incentives that encouraged migrants to exploit subsidies rather than in response to opportunities for more productive employment"*. Furthermore, as argued by Potts (2016, p. 261), *"migration rates go up when [urban] employment is being generated but are not sustained in the face of strong negative changes in urban economies, incomes and condition; they change in logical ways and according to the basic precepts of standard neo-classical migration theory"* (see Section 1.1.2). Therefore, for a country where urban unemployment is pervasive, and poverty is enduring (see Section 4.2), the drastic change in urban population over the past decades in Kumasi and Obuasi is significant when considered in the context of the capacity of the cities to provide adequate job and wealth creation. From an environmental perspective, the sustainability implications of rapid urbanisation transcend beyond the urban areas themselves. This can be explained by the reality that an increasing population will expend more ecological resources to meet their basic needs (for example, food), as well as to assimilate their waste (see Chapter Four). Based on the evidence presented in Section 4.3.2.3 which showed that Ghana's ecological footprint has surpassed bio-capacity, the observed drastic upward changes in the population is expected to increase the ecological footprint in Obuasi and Kumasi, and potentially threaten ecological sustainability. From a social perspective, rapid urbanisation in Kumasi and Obuasi poses social challenges. While the inhabitants of Kumasi and Obuasi may be perceived as better off compared to their rural counterparts (in terms of standard of living), increasing populations mean that more housing, water, and sanitation infrastructure will have to be provided. In a country where a significant proportion of the population does not have access to basic infrastructure (see, for example, Amoh-Gyimah and Aidoo 2013; Yakubu et al. 2014), a rapid change in demographic urbanisation will likely mean that more people will compete for access to these infrastructures in order to meet their basic needs, which could widen already entrenched inequality. Also, the high proportion of migrants could potentially affect social cohesion and harmony. Under these scenarios, it can be argued and inferred from the literature (see, for example, Farvacque-Vitkovic et al. 2008; Smit and Parnell 2012; Okeke 2014) that if urbanisation (in the demographic context) in Kumasi and Obuasi proceeds without adequately-planned economic and social preconditions, then sustainability challenges become

inevitable. The implications are the potential growth of slums, worsening environmental conditions, deepened social tensions, and the overall deterioration of the quality of life for the cities' residents (see, for example, Ofori 2009; Osei-Boateng and Ampratwum 2011; Okyere et al. 2012). Therefore, the demographically-shaped urbanisation in Obuasi and Kumasi potentially affects the sustainable development requirement of meeting the basic needs of citizens as the trajectory of the urbanisation process may not be conducive for the realisation of sustainability ambitions.

5.2.5.3 Landscape urbanisation in Kumasi and Obuasi.

The extensive land use choices and demands stimulated by the urbanisation process have resulted in fundamental changes to the landscape in Kumasi and Obuasi, thereby posing significant risks to living conditions, the natural environment, and development. The analysis of the LULC maps shows that the urban areas under examination have gradually expanded due to the forces of urbanisation. In general, the findings suggest that landscape urbanisation in Kumasi and Obuasi is characteristically a two-step process as forest and mixed woody vegetation land cover types were lost to agricultural land cover, which, in turn, was lost to built-up or urban land cover (see Appendix 5). For Kumasi, the forces of urbanisation have set LULC patterns on a clear trend towards an increase in built-up cover and loss of natural vegetation. For example, between 1986 and 2018, significant portions of the forest land cover class in Kumasi and its immediate surroundings had been converted into a dominant urban landscape. Specifically concerning urban expansion, the findings (Table 5.3) indicate that the built-up share of Kumasi's land cover expanded by over 1,105% between 1986 and 2018. This has led to Kumasi's expansion beyond its 254 km^2 administrative boundary to merge with adjoining districts. In contrast, the landscape change in Obuasi has occurred within its administrative boundary and urban expansion has been scattered. As would be expected of an area with a history of mineral exploration and mining, urbanisation and mining activities resulted in built-up land cover and mining-related land cover classes being significant aspects of land cover transformation in Obuasi. Specifically concerning urban expansion, the findings (Table 5.3) indicate that the built-up share of Obuasi's land cover expanded by over 144% between 1986 and 2018. Thus, although not in the same magnitude as Kumasi, built-up land cover in Obuasi has expanded in relative proportions at the expense of non-built-up land cover over the study period. Essentially, however, there was densification of expansion in Obuasi as population density increased by 72% between 1984 and 2019, compared with

Kumasi where population density decreased by 277% (see Table 5.5). In this context, unlike in Kumasi where urban expansion had spread out in all directions from the urban core, the urban land cover in Obuasi seemed to concentrate on the western side of the municipality. Based on local knowledge and personal observations, and consistent with observations in Google Earth imagery, the concentration of urban land cover in western Obuasi is explained by: (i) the location of AngloGold Ashanti's mining operations in the western side of the municipality; (ii) the location of the urban core in the western part of the municipality by mainly surrounding the mining operations; and (iii) the possibility that the prevailing land ownership regime, especially in the context of protected mining concessions, affects acquisition and development of new lands, thereby constraining urban expansion to the western side of the municipality. In the end, although no two urban areas are perfectly identical, the study sites exhibited some similarities that are relevant to the current debate as the impacts of land cover change, especially in the context of sustainability, potentially transcends physico-administrative boundaries. In all, the land cover classification and analysis have given a more fine-grained picture and diachronic analysis of landscape transformation in Kumasi and Obuasi (from a comparative perspective) over the last three decades. Consistent with the findings from the literature (for example, Attua and Fisher 2011; Coulter et al. 2016; see Section 4.4.1), the findings in this study demonstrate that rapid urbanisation in Ghana's urban areas has led to increased replacement of natural land cover by urban land cover. Furthermore, exploring the urbanisation process of landscape transformation in Kumasi and Obuasi highlights the importance of understanding the factors shaping LULC change in these cities. These are identified and explained in terms of (a) city size and administrative hierarchy; and (b) market and state forces.

(a) City size and administrative hierarchy.

From a landscape perspective, the size or hierarchy of an urban area can shape its landscape urbanisation process as it potentially determines available opportunities for improved life (Tselios 2014). Thus, as was noted in literature reviewed in Chapter Two, large cities (for example, capital cities and metropolitan regions) are shaped by urbanisation economies while small cities are shaped by localisation economies (McCann and Shefer, 2004). Furthermore, Scott and Storper (2003, p.581) suggested that *"large cities are locomotives of the national economies within which they are situated, in that they are the sites of dense masses of interrelated economic activities and offer a wider and better quality of the producer services that are essential to technological innovation*". These observations are evident in the present

study and they are explained as follows. For instance, as the second biggest city in Ghana and the capital of the Ashanti Region, Kumasi is bigger than Obuasi, both in terms of population size, and also in terms of administrative hierarchy. The differences in population and administrative size mean that there is no horizontal equity in the availability of social, economic, and environmental opportunities between Kumasi and Obuasi. Thus, the potentially higher number of opportunities in Kumasi will lead to higher urbanisation levels as accentuated in the migration statistics in Figure 5.11. An increasing number of migrants, alongside natural population, will subsequently shape landscape urbanisation, as land will have to be converted to meet the basic needs of the increased number of people seeking better opportunities in life. In effect, the population size and hierarchy of Kumasi makes it a net gainer of resources, including institutional and human resources, as compared with Obuasi (see Fielding 1989; Kim and Rowe 2012), and determine the extent of landscape urbanisation in the process.

(b) The role of the market and administrative forces in the context of land.

A leading factor that shapes landscape urbanisation is the role of market forces (Brenner and Theodore 2002; Lee and Zhu 2006). Generally, rapid urbanisation in Ghana has created a significant demand for land. The rapid increase in built-up land cover in Kumasi and Obuasi (shown in Figure 5.9 and Figure 5.10 respectively) reflect this demand. Save for vested State lands, the majority of land in Ghana is held privately by customary landholders for communities or allocated long-term to powerful companies (Aubynn 2006; Tsikata and Yaro 2011). As argued in Section 2.2.4 and Section 4.2.2, land owners will seek to derive maximum economic benefits from their land assets (Nyame and Blocher 2010; Leon 2015). As a result, at any point in time, the market forces determine how land is used (Nyame and Blocher 2010; Leon 2015). The result of the population explosion in Kumasi and Obuasi discussed in the previous paragraphs is that it drives the market to make decisions on land conversion to accommodate the population's basic needs and services. Satisfying these needs could range from making land use decisions to construct houses to the intensification or commercialisation of agriculture in order to meet the food needs of the population. Market-influenced land conversion, in this case, can be favourable where it leads to the replacement of, for example, abandoned or unproductive land cover by urban development, while it could be deemed as unfavourable when it results from the encroachment or conversion of fragile land covers like water bodies and wetlands (see Section 4.4.1). In the end, the greater proportion of land use decisions that drives urbanisation are stimulated by the diverse ways in

which landowners respond to market prices and policy incentives (Theodore and Brenner 2002; Lee and Zhu 2006; Gales 2016). What this means is that land use decisions by market force actors in Obuasi and Kumasi are important determinants of landscape urbanisation.

Separate from the role of market forces, the State (expressed as administrative and political forces) exerts critical influence on the relationship between urbanisation and LULC change. Although the State does not own the greater portions of land in Ghana, it is responsible for the regulation of land development through the various planning and enforcement instruments at its disposal. Also, it can trigger certain legal instruments such as compulsory purchase orders in order to acquire land from farmers for other uses. Even for the land that the State owns, land conversion from agricultural to urban uses can be a strategic way of attracting investments for much needed industrial growth. This could potentially lead to de-agrarianisation in typically agrarian areas. Take the example of Obuasi where the investment decision for the operation of a gold mine resulted in the expropriation of land from farmers and the subsequent direct conversion of natural vegetation into mining land. The indirect rippling effect of the operation of the mine in Obuasi, potentially, is the conversion of natural land cover into urban land cover in order to provide urban infrastructure for the population. Thus, it could be argued that urbanisation-related LULC change is driven by economic and political instruments and incentives emanating from the marketisation of landscape development. In the end, there is a possibility for these instruments to, in turn, undermine the enforcement of land use plans and trigger unplanned and uncontrolled conversion of land.

The explication of factors shaping landscape transformation has shown that LULC change in Kumasi and Obuasi is a path-dependent process that is underpinned by political and administrative processes, socio-economic conditions, and historical decisions. The discussion so far shows that irrespective of planning provisions, the pace and nature of landscape change in Obuasi and Kumasi are shaped by other factors (as discussed above). As expected, differences between Kumasi and Obuasi, in terms of city size, have significant influence on landscape urbanisation. Also, the influence of the market in the context of land tenure and access in most of Ghana is a critical factor for LULC change. In the end, it can be argued that land use decisions which result in an urbanisation-related land cover change in the study sites are stimulated by the actions of landowners and managers in response to the market forces and policy. This implies that if urbanisation (and the resulting LULC change) in the two areas is to proceed sustainably, then externalities such as market forces will have to be effectively

managed. By adopting remote sensing techniques, the major land use and land cover changes in the study areas over three decades have been demonstrated. Essentially, it is evident from the findings that urban development is the single most important factor influencing land cover change in the study areas. Therefore, the pattern and manner of landscape urbanisation will be a reflection of how urban development drives changes in LULC.

5.2.5.4 Sustainability implications of landscape urbanisation.

Under increasing population and economic pressures, it is important to discuss the sustainability implications of the reported LULC changes in Kumasi and Obuasi. Table 2.1 has shown some of the attributes of a sustainable urban form, and the literature reviewed in Chapter Two (see Sections 2.3.3 and 2.4.2.2) has outlined some of the visions of sustainable cities and the sustainability implications of urban sprawl (as a result of landscape urbanisation). Furthermore, realising sustainable development requires that, at a minimum, the basic needs of society must be met (WCED 1987). The findings on sustainable development in Ghana in Chapter Four serve as a pointer for the developmental needs in Ghana as they suggested that while Ghana was making steady progress concerning meeting the basic needs of its citizens, its current development level means that it has not reached threshold levels beyond which it could safeguard the needs of its citizens. The links between urban sprawl and sustainable urban form, and meeting the basic needs of society, thus, become yardsticks for discussing the implications of the urbanisation-induced LULC change for urban sustainability in the study sites.

In general, consistent with the views of scholars (for example, Zeng et al. 2005; Wang et al. 2020), the findings (see Figures 5.9–5.10) suggest that landscape urbanisation (due to expansion of urban land cover) has resulted in urban sprawl in Kumasi and Obuasi. However, despite the reality that the populations of both urban areas expanded by at least three times within the study period, the sprawl was more significant in Kumasi as urban expansion in Kumasi moved beyond the city's 254 km^2 administrative boundary into adjoining districts, compared with Obuasi where urban expansion was within the administrative boundaries. The sustainability implications of the reported urban sprawl in Obuasi and Kumasi can be explained as follows. Consistent with the literature (for example, Aurand 2007; Abudu et al. 2018), the findings suggest that urban expansion (especially in Kumasi) has resulted in less-compact urban forms and low-density development. This means that urban sprawl (due to the

uncontrolled and poorly-managed urban expansion in Kumasi and Obuasi) has led to the consumption of more land resources than is probably necessary (see for example, Zhao et al. 2014). Also, for Kumasi, the prevailing urban expansion is characteristic of a low-rise sprawl as it can be inferred from the findings (Table 5.5) that the density of development has been low (see for example, Aurand 2007; Abudu et al. 2018). This means that, for example, citizens living in more spread out areas of Kumasi will potentially travel long distances in order to access economic opportunities and urban services in the city centre (see for example, Hamiduddin 2018). This, in turn, potentially leads to air pollution and climate change as higher quantities of pollutants such as GHGs are likely to be produced from urban transport (see for example, Polidoro et al. 2012; Baur et al. 2013). Low density developments also mean that social cohesion is potentially undermined as interactions among citizens are likely to be minimal in low density and scattered neighbourhoods of urban areas (see for example, Aurand 2007; Abudu et al. 2018; Bosehans and Walker 2020).

In terms of meeting basic needs, the transformational effect of urbanisation (as reflected in land cover change) has implications for food security. Using Kumasi as an example, it has already been suggested that there has been an outward expansion of its built-up area beyond administrative boundaries. At the same time from Table 5.1, natural vegetation cover consisting of agricultural land, forest, and mixed woody vegetation had decreased by 60% between 1986 and 2018. This makes it logical to argue that the dramatic expansion of urban land cover in the Kumasi area, for instance, has potentially led to the conversion of prime agricultural lands located within the city and in the previously peri-urban areas surrounding it. Thus, while agriculture might be a spatial concept, it is an important determinant in the urbanisation of previously rural areas in terms of land use change. Therefore, it is logical to assume that agricultural land will continue to be a repository for landscape urbanisation unless it can match the urban development pressure through market-based competition or well-enforced legal protection. This is because urbanisation-induced landscape changes affect agricultural production, thereby making it an important factor in any urbanisation-related conversation. Thus, although the contribution of urban agriculture to the sustenance of the over two million citizens in Kumasi cannot be overstated, its potential contribution to increasing access to food and serving niche markets (like the supply of fresh vegetables) cannot be understated. Taken together, the findings demonstrate that food security, among other relevant socio-economic indicators which have implications for urban sustainability, is intricately linked to LULC change.

The sustainability impacts of land use change due to urbanisation is a double-edged sword in relation to the source of livelihoods (employment) of urban citizens in Kumasi and Obuasi. LULC change due to urbanisation could imply that there is a more beneficial use of land which could improve the source of livelihoods of urban citizens. Take the case of Kumasi, where over two million citizens live, for which the pressure for a source of livelihood is potentially enormous. An increase in urban land use could result in the construction of industries or other forms of job creation, which would serve as sources of livelihoods for citizens. Nevertheless, the earlier-mentioned impact of market-forces means that agricultural land could be expropriated from farmers for other uses (see, for example, Leon 2015; Le Gales 2016). The review of urban challenges in Ghana in Chapter Four alludes to this occurrence based on the suggestion that urban informality in Ghana is fuelled by the dispossession of the rural-poor of their lands, which in most cases, were a source of livelihood and shelter (Obeng-Odoom 2013a). In Ghanaian cities, where there is widening inequality and poverty is pervasive (Obeng-Odoom 2012; Cooke et al. 2016), their plight is potentially worsened where alternative means of livelihoods are lacking (see Section 4.2).

The implications of land cover change for urban sustainability can also be discussed based on alignment with sustainability goals, as explicated through weak or strong sustainability (see, for example, Ekins 2011; Neumayer 2013; Wu 2013). The mere conversion of natural vegetation into urban cover in Kumasi and Obuasi can be interpreted as consistent with sustainability goals when viewed in the context of weak sustainability (see, for example, Ekins 2011; Neumayer 2013; Wu 2013), where natural capital is substituted for human capital. As shown in Tables 5.1 and 5.2, the dominant land cover change for both Kumasi and Obuasi over the study period was the conversion of natural vegetation to urban land cover. As urban land cover encompasses social, economic, and environmental infrastructure required by society, it can be argued that land cover change is sustainable as the multiple benefits of urban infrastructure are assumed to offset natural vegetation loss. For example, population increases recorded in both Kumasi and Obuasi will naturally create demand for additional housing (see, for example, Yakubu et al. 2014), which, more often than not, leads to the clearing of natural vegetation for housing construction. Land cover change, in this instance, can be viewed as consistent with sustainability principles as social benefits are accrued from housing construction. Conversely, if the principle of strong sustainability applies (see, for example, Ekins 2011; Neumayer 2013; Wu 2013), where natural capital cannot be substituted for human capital, the findings on land cover change in the two areas

might be interpreted as inconsistent with the goals of sustainability. As shown in the literature review, the functions and services provided by natural capital (for example, natural vegetation) cannot be replaced by human capital at any costs. Hence, using the same example of housing demand in response to a growing urban population in Kumasi and Obuasi, social and economic gains of land use change for the purposes of housing construction is inconsistent with the tenets of strong sustainability.

The reality, however, is that rapid demographic urbanisation in both Kumasi and Obuasi accentuates a dilemma of sustainable development where the basic needs of society must be met. This means that land will have to be developed to provide these needs, with the consequence being the transformation of vegetation cover. Accordingly, whether the sustainability implications of the land cover change recorded are judged through the lens of weak or strong sustainability, an inevitable reality is that land contains environmental assets that are necessary for the production of goods and services, and at the same time necessary for the maintenance of the integrity of the ecological environment. Therefore, if the principles of sustainable development, which include meeting basic needs of society, including housing, water and food will be achieved, then it is inevitable that a balance between strong and weak sustainability will have to be reached. Nevertheless, from the perspective of this research, the crux of the matter in relation to the sustainability judgment of land cover change in Kumasi and Obuasi based on the findings, hinges on the nature and magnitude of changes in land cover over the study period. From an overall system perspective, the magnitude of land cover changes in Kumasi and Obuasi (as mainly driven by urban development), bears the risk of producing undesirable alterations to the urban form, as well as the environmental and socio-economic systems in the study sites. Taken together, the factors mentioned above make it safe to argue that land use change (due to the pressures of urbanisation) may be necessary if the minimum requirement of providing the basic needs of urban citizens are to be met. However, the discussion above also demonstrates that unmonitored and uncontrolled land use change potentially threatens sustainability in Kumasi and Obuasi by creating unsustainable urban forms.

5.2.6 Section summary.

In the last few decades, urbanisation and related-anthropogenic activities have led to extensive population growth and land cover changes that have implications for the

sustainability of urban regions in Ghana. This section has provided a nuanced understanding of urbanisation in Kumasi and Obuasi and has shown that the process does not merely result in changes in landscape and population, but it is multi-dimensional and involves population, landscape, development, and society. The impact of urban growth and landscape transformation on the urbanisation process in two urban areas in Ghana (Kumasi and Obuasi) has been evaluated. The findings have shown that over a three-decade period, the population in Kumasi had quadrupled while that of Obuasi had tripled. Consistent with the identified drivers in literature, demographic urbanisation was primarily attributed to natural population growth and migration (Cobbinah et al. 2015a; Jedwab et al. 2017). In relative proportions, migration contributed more to urbanisation in Kumasi than it did for Obuasi. Factors that shaped this were identified to include city and administrative size; and market and administrative forces. From the point of view of this study, the relative differences in demographic shifts between the two areas based on the evidence presented are essentially judged as an economic one, as the local economies in the two areas determined their attractiveness for both emigration and immigration within any period. This observation is consistent with the literature (see for example, Ferguson 1998; Davidson and Arman 2014) which suggests that the urbanisation process is fundamentally shaped by the prevailing economy.

The study has produced land cover maps on Kumasi and Obuasi for 1986, 2000, 2010, and 2018 based on images remotely-sensed by sensors on board Landsat 5 (TM), Landsat 7 (ETM+) and Landsat 8 (OLI_TIRS). Accordingly, the dynamics of land cover change in the two areas have been quantified and presented. The following general trends in land cover change were recorded: urban expansion, agricultural land loss and deforestation. Specifically concerning urban expansion, the findings presented have shown that the built-up share of Kumasi's land cover had expanded from 5.3% in 1986 to 62.5% in 2018 (see Section 5.2.1). Spatially, land cover change due to urban expansion in Kumasi was outward from the centre, which meant that adjoining smaller districts and towns have been physically engulfed by Kumasi. In Obuasi, the findings have shown that the built-up share of land cover had expanded from 6.2% in 1986 to 15.2% in 2018 (see Section 5.2.1). Thus, although not in the same magnitude as Kumasi, built-up land cover in Obuasi has expanded in relative proportions at the expense of non-built-up land cover over the study period.

Aside from the demographic and LULC information reported, the implications of the demographic shift and landscape transformation for sustainability in the study sites have also been considered. Taken together, population dynamics and LULC (in particular urban cover expansion) have varied implications for sustainability in Kumasi and Obuasi. These include the creation of unsustainable urban forms, threats to the capacity to meet basic needs (food insecurity), and population pressures on the capacity to provide urban services and economically engage citizens. The evidence presented in the form of demographic statistics and land cover maps for Kumasi and Obuasi has shown that urban challenges (see Section 4.2) would potentially be exacerbated if urbanisation continues in its present course. While the full implications of the quantum change in LULC and population growth are yet to filter down, what is clear from the findings is that there is a need for a paradigm shift; a complete change in perspective, in order to meaningfully address the impacts of past and contemporary demographic growth and landscape transformation on sustainability in Kumasi and Obuasi. In summary, the findings reported highlight the critical links between LULC, urbanisation, and urban sustainability in the two urban areas studied.

5.3 An assessment of the sustainability implications of urbanisation in Kumasi and Obuasi based on selected socio-economic indicators

A paucity of disaggregated and robust city-level indicator data (for example, on the MDGs and SDGs) for Kumasi and Obuasi means that the analysis on progress in human and sustainable development in this section proceeded with available and accessible data. Therefore, to better situate the data in context, reference will be made to Ghana's HDI and the respective components explored in Chapter Four. An important caveat in interpreting the city level statistics presented, therefore, is that they include very basic indicators which, one could argue, might be crude representations of development in Kumasi and Obuasi. Nevertheless, they are crucially the most widely available data that are useful to explore progress on sustainable development in the study areas.

5.3.1 Education and human development in Kumasi and Obuasi.

5.3.1.1 Literacy levels.

As a measure of a person's ability to read and write, Figure 5.12 presents the literacy levels in Kumasi and Obuasi based on the 2010 census report. From Figure 5.12, in Kumasi, 89.5% of

the total number of 1,303,168 persons who were 11 years and older were literate, with the remaining 10.5% illiterate; compared with Obuasi where 87.4% of the total 124,675 who were 11 years and older were literate, with the remainder illiterate. The findings show that although literacy levels are marginally higher in Kumasi than in Obuasi, on a general level, it is high in both areas.

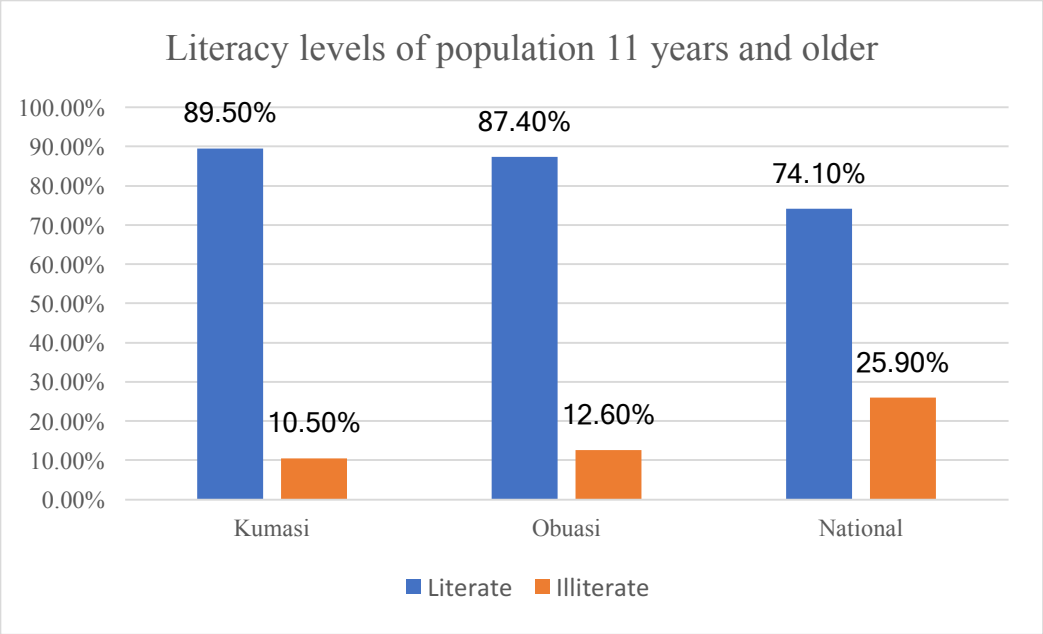

Figure 5.12: Literacy levels of the population aged 11 years and older in Kumasi and Obuasi.

Source: Ghana Statistical Service (2014a; 2014b; 2014c).

5.3.1.2 Pupil-teacher ratio in Kumasi and Obuasi.

As a measure of the quality of education, the pupil-teacher ratio (PTR) in primary schools in Kumasi and Obuasi in 2012 are presented in Table 5.6. From the table, it is seen that while the PTR in Obuasi (1:22) was lower than the national level of 1:35, the PTR in Kumasi (1:38) exceeded the national level of 1:35. This means that, generally, classrooms were overcrowded in Kumasi compared with Obuasi.

Table 5.6: Pupil-teacher ratio in Kumasi and Obuasi for 2012.

	PTR
National ratio	1:35
Kumasi	1:38
Obuasi	1:22

Source: National Development and Planning Commission (2019).

5.3.1.3 Gender Parity Index in Kumasi and Obuasi.

The Gender Parity Index (GPI) scores for Junior High Schools in Kumasi has been recorded as 0.95 for the 2011 / 2012 academic year, compared with 0.88 recorded in Obuasi (National Development and Planning Commission 2019). A GPI of 1 means that there is an equal number of boys and girls; a GPI of less than 1 means that there are more boys than girls, while a GPI greater than 1 means that there are more girls than boys. This means that the number of girls completing the full basic school cycle was higher in Kumasi than in Obuasi. Reasons attributed to the high GPI in Kumasi include increased sensitisation on female education, while the low GPI in Obuasi has been attributed to reasons that include girls dropping out of school to engage in illegal small-scale mining (see, for example, Azumah et al. 2019).

5.3.2 Life expectancy and human well-being in Kumasi and Obuasi.

The data on overall life expectancy in Ghana has already been presented in Table 4.1 (see Chapter Four). From the table, life expectancy in Ghana increased from 56.8 years in 1990 to 63.8 years in 2018. As a measure of life expectancy at the municipal level, data on aspects of mortality in Kumasi and Obuasi are presented to include Crude Death Rate and Maternal Mortality Rate.

5.3.2.1 Crude Death Rate (CDR).

Table 5.7 shows the Crude Death Rate, which measures the number of deaths in a year per 1000 mid-year population of a specific year, for the two areas. As shown in Table 5.7, CDR in Kumasi in 2010 was 4.8 compared with 4.4 recorded for Obuasi. This means that in the 12 months preceding the census in 2010, approximately five people died per 1,000 persons in Kumasi compared with an approximate number of 4 deaths per 1,000 persons recorded in Obuasi. This means that mortality (expressed herein as total crude death), as a measure of life expectancy, was relatively lower in Obuasi when compared with Kumasi. The CDR in both areas was, however, lower than the regional aggregate of approximately six deaths per 1,000 persons.

Table 5.7: Crude Death Rate (per 1,000 persons) in Obuasi and Kumasi based on total population and household death.

Location	Total Population	Death in Households	Crude Death Rate
Kumasi	1,730,249	8,110	4.7
Obuasi	168,641	778	4.4
Regional Aggregate	4,780,380	27,948	5.8

Source: 2010 Population and Housing Census, Ghana Statistical Service (2014a).

5.3.2.2 Maternal Mortality Rate (MMR) in Kumasi and Obuasi.

Table 5.8 presents the maternal mortality statistics, measured as the ratio of the number of deaths due to pregnancy and childbirth per 100,000 live births, in Kumasi and Obuasi for the 2015-2017 period. From the table, it is seen that MMR in Obuasi (600) was higher in 2015 and 2016 when compared with Kumasi (300). However, by 2017, the MMR in Obuasi had improved to 100 compared with Kumasi which remained constant at 300.

Table 5.8: Maternal mortality rate (MMR) in Kumasi and Obuasi, 2015-2017.

Location	MMR (per 100,000 live births)		
	2015	2016	2017
Kumasi	300	300	300
Obuasi	600	600	100

Source: National Development and Planning Commission (2019).

5.3.3 Living standard in Kumasi and Obuasi.

5.3.3.1 Access to improved sanitation in Kumasi and Obuasi.

The reported proportion of urban population with access to improved sanitation between 2014 and 2017 is presented in Table 5.9. From the table, it is seen that access to improved sanitation is generally higher in Kumasi than in Obuasi. For example, in 2014, there was 84.5% access in Kumasi compared with 56% in Obuasi, although both were higher than the recorded average national value of 15% access. While access to sanitation in Obuasi improved to 68% in 2017, it was significantly below the 86% recorded in Kumasi but still higher than the national value of 15%.

Table 5.9: Access to improved sanitation in Kumasi and Obuasi.

	2014	**2015**	**2016**	**2017**
Kumasi	84.5%	84.7%	85%	86%
Obuasi	56%	60 %	62%	68%
National values	15%	15%	15%	15%

Source: National Development and Planning Commission (2019).

5.3.3.2 Sustainable access to safe water sources in Kumasi and Obuasi.

The reported proportion of the urban population with sustainable access to safe water sources in Kumasi and Obuasi between 2014 and 2017 is presented in Table 5.10. From the table, it is seen that in 2014, access to sustainable water sources was significantly higher in Kumasi (97%) when compared with Obuasi (75%), although both Kumasi and Obuasi scored significantly higher than the average national urban value of 55.9%. By 2017, access to safe water had improved significantly in Obuasi to 95% but marginally lower when compared with Kumasi (98%), although both urban areas recorded were significantly higher values than the national urban average of 75%.

Table 5.10: Sustainable access to safe water sources in Kumasi and Obuasi.

	2014	2015	2016	2017
Kumasi	97%	98%	98%	98%
Obuasi	75%	80%	95%	95%
National urban values	55.9%	77.1%	76%	75%

Source: Source: National Development and Planning Commission (2019).

5.3.4 Discussion.

5.3.4.1 Education and human well-being in Kumasi and Obuasi: implications for sustainability.

A notable observation from the findings is the steady expansion of education access, as shown in the national level HDI improvement (see Chapter Four) and demonstrated at the urban-level by the high literacy levels in Kumasi and Obuasi. Table 4.1 (see Chapter Four) sets the context of education progress in Ghana as it shows that there has been a national improvement in the education component of human development (demonstrated by the increase in 'mean years of schooling' and 'expected years of schooling' from 7.6 years and 4.9 years respectively in 1990, to 11.5 years and 7.2 years in 2018). Accordingly, this reported improvement in education is corroborated in this study with evidence on high literacy levels at the national level (national average of 74.1% literacy). At the urban-level, literacy was marginally higher in Kumasi (89.5%) than in Obuasi (87.4%) based on the 2010 census report. Moving on to the quality of education, this study found contrasting evidence for Kumasi and Obuasi based on the pupil-teacher ratio (PTR). The PTR in Kumasi (1:38) was higher than the national average (1:35); compared with Obuasi which had a PTR of 1:22. The findings imply that, consistent with national improvements in education, access to education in Kumasi and Obuasi was high. However, based on the PTR, the findings imply that the quality of education in Kumasi is potentially compromised due to relatively overcrowded classrooms. This observation could be attributed to the impact of population pressure on education infrastructure. This is expected as the population in Kumasi has increased significantly in recent years compared with Obuasi (Ghana Statistical Service 2019). A normative interpretation from the findings includes the coverage of gendered needs in education. For example, as was shown in Section 5.3.1.3, sensitisation on female education

has led to a high proportion of girls who enrolled and completed the basic education cycle in Kumasi as its GPI was 0.95 in the 2011/2012 academic year. Thus, it could be argued that policy responses to promote female education have been effective. However, in the case of Obuasi the low GPI (0.88 in the 2011/2012 academic year) has been attributed to reasons including the engagement of pupils in small-scale mining (see, for example, Azumah et al. 2019). This is consistent with arguments made in Chapter Two concerning how the prevailing economy fundamentally shapes sustainability (see, for example, Davidson and Arman 2014). Nevertheless, these findings show that, consistent with national progress, Kumasi and Obuasi are making progress to meet SDG 4 through inclusive and equitable enrolment and retention of pupils at the basic school level.

In situating the findings on education (in relation to human well-being) within the overall context of this study, the implications of education as a component of sustainability in Kumasi and Obuasi are evident. In this case, one might question whether education functions as a driving force towards achieving sustainable development in the study areas. This is because while the increase in gender parity index and pupil-teacher ratio is in consonance with the improvements and expansion of access to education for the citizens shown in national level HDI, paradoxically, it will appear, based on the Ghanaian urban challenges identified in Section 4.2, that this has not translated into reduction in aspects of development such as unemployment or inequality. Nevertheless, as was shown in Chapter Four, education plays a prominent role in promoting sustainable development (see Pigozzi 2007). Subsequently, in Section 4.3.1, Sen (1999, p.295) has argued that "*a person may benefit from education through reading, communicating, arguing, in being able to choose in a more informed way, in being taken more seriously by others and so on. The benefits of education, thus exceed its role as human capital"*. This precise notion of education being a key panacea to the sustainable development challenges in Ghana is also shaped by Ghana's development and education policies expressed in Section 4.3.1. For example, the Free Compulsory Universal Basic Education (FCUBE) policy introduced in 1995 (Acheampong 2009) and the Free Senior High School Policy introduced in 2017 (Arthur-Mensah and Alagaraja 2018), stress the relevance of education to the SD journey of Ghana and recognise how the challenge of poverty undermines the achievement of universal education as, for example, most parents were unable to afford the cost of education (Alderman and Brundy 2011). Thus, in congruence with the views already captured in the literature (for example, Sen 1999), the argument advanced by this study (based on the national and urban level findings) is that the

sustainability implications of human development through education in the study areas is not limited to labour market returns. To the extent that sustainable development in Ghana is fundamentally constrained by poverty and limited infrastructure (Domfeh et al. 2012), improvements in education in the study areas (as demonstrated by the improved pupil-teacher ratio) could potentially improve the sustainable development situation. Finally, as will be shown in Section 5.4, from the angle of citizens' attitudes and commitment to pro-sustainability behaviours, there is a clear role for development education in providing opportunities for citizens to be able to make informed decisions about how they can contribute to sustainable development through positive attitudes and practices. In sum, it is argued that while education in Kumasi and Obuasi (as represented by findings of high literacy levels and high pupil-teacher ratios shown in Table 5.6 and Figure 5.12) cannot exclusively achieve sustainable development in these areas, the findings demonstrate the fundamentally important enabling role that education plays (in coordination with other socio-economic processes) to equip citizens with the skills necessary to play active roles in the economy, and in turn, stimulate socio-economic growth thereby supporting the quest for broader sustainable development in the study areas (Sen 1999).

5.3.4.2 Life expectancy and human development in Kumasi and Obuasi: implications for sustainability.

Healthy citizenry is central to achieving environmental, economic, and social development. The values of 'Crude Death Rate' in the study sites based on the 2010 census report (as shown in Table 5.7) suggest that mortality in Obuasi (4.4 deaths per 1,000 persons) was lower than in Kumasi (4.7 deaths per 1,000 persons), although both were below the regional average of 5.8 deaths per 1,000 persons. With respect to maternal mortality, it can be inferred from the findings in Table 5.8 that the MMR in Kumasi remained constant at 300 deaths per 100,000 live births from 2015 to 2017; compared with Obuasi where maternal mortality was 600 deaths per 100,000 live births from 2015 to 2016, reducing to 100 deaths per 100,000 live births in 2017. These findings show that there is a clear stratification of mortality dimensions based on the size of the study sites and suggests that the general health in the population was better in Obuasi than in Kumasi. As MDG 5 considers maternal health, the very high maternal mortality rates in Kumasi and Obuasi in 2015, at 300 and 600 respectively, mean that both cities could not achieve the MDG target of 185 / 100,000 live births. With respect to achieving the SDG 3 goal of 'ensuring healthy lives and promoting

well-being for all at all ages', which pushes for an MMR target of less than 70 deaths per 100,000 live births by 2030, the latest figures in 2017 suggest that, all things being equal Obuasi (100 / 100,000), is well placed to meet the SDG target on maternal health compared with the unacceptably high MMR of 300 / 100,000 in Kumasi (as of 2017). Whatever the case, strong and sustained efforts will be needed to enhance maternal health in Kumasi and Obuasi.

While debating the reasons behind the state of health in Kumasi and Obuasi (as inferred from the statistics presented) is beyond the scope of this study, an undeniable reality is that rapid urbanisation and population growth will shape the contemporary and future health possibilities in these cities, and subsequently determine sustainable development progress in the two cities. Thus, consistent with the literature, urban advantage in health service provision (Vlabov et al. 2005) might enhance maternal health as the better facilities in Obuasi and Kumasi (compared with rural areas) could mean that mothers and new-borns have access to modern healthcare facilities, well-trained personnel, and reduced travel times to access these facilities, thereby potentially reducing maternal mortality. Alternatively, reported impacts of inequality in health access in urban areas (Matthews et al. 2010) might also imply that current poor performance in aspects such as maternal mortality in both Kumasi and Obuasi will be exacerbated by contemporary and current rapid urbanisation, thereby impeding sustainable development progress.

5.3.4.3 Living standards in Kumasi and Obuasi: implications of access to improved water and sanitation in Kumasi and Obuasi for sustainability.

Water and sanitation are critical to the sustainable development agenda (United Nations 2019). The findings showed that access to improved water and sanitation services in the urban areas studied were generally higher than the national average. Table 5.9 showed that between 2014 and 2017, Kumasi maintained relatively high levels of access to improved sanitation compared with Obuasi. However, within the same period (2014–2017), Kumasi and Obuasi scored higher than the national average score. Both Kumasi and Obuasi, therefore, exceeded the MDG 7 target of halving the population without access to improved sanitation facilities. Similarly, the findings presented in Table 5.10 showed that Kumasi recorded near-universal sustainable water access at 97% in 2014, rising marginally to 98% in 2017, compared with Obuasi, where an access level of 75% was recorded in 2014, rising

substantially to 95% in 2017. Again, these were above the national levels of 55.9% and 75% recorded in 2014 and 2017 respectively. This means that consistent with the national performance, Kumasi and Obuasi exceeded the MDG 7C target of halving the proportion of people without sustainable access to safe drinking water. An important caveat, however, is that these figures may have been adjusted to serve political ends (see, for example, Weststrate et al. 2019).

Considering SDG 6 'ensuring the availability and sustainable management of water and sanitation for all', a critical question in relation to the current discussion, however, is the extent to which the noteworthy progress reported for both cities with respect to the MDGs enhances their chances of meeting SDG 6. It could be argued that the challenge on the possibility of Kumasi and Obuasi to meet SDG 6 lies in the difference between the cities' performance and the national performance. Consistent with the idea that people move to cities in search of better opportunities for life (Njoh 2003); and taking cognisance of the rapid pace of population growth and the migrant proportion of the population in Kumasi and Obuasi (see Section 5.2), there is a likelihood that rapid urbanisation (due to natural population growth and migration) will lead to the concentration of populations in these areas and potentially overwhelm the capacity to provide urban services (Farvacque-Vitkovic et al. 2008; Okeke 2014). This, from the perspective of this study, creates an impression that rapid urbanisation in Kumasi and Obuasi creates intractable impacts that undermine the achievement of SDG 6. In sum, the findings and discussions so far highlight the critical dynamics between water and sanitation service provision and population growth, and stress the need for city authorities to constantly invest in new water and sanitation infrastructure while maintaining existing ones in order to keep to up with the rapid pace of urbanisation.

5.3.5 Section summary.

This section has demonstrated the variations in aspects of human and sustainable development in Kumasi and Obuasi as reflected through comparisons of indicators on education, health and living standards. Consistent with the overall national improvements in human development (see Chapter Four), the findings (based on data available) have shown that both Kumasi and Obuasi have experienced significant improvements in education (literacy rates, PTR, GPI), living standards (access to water and sanitation), and health (life expectancy); which, from the perspective of this study, have become dominant contributors

to overall improvements towards sustainability in the study areas. The findings are, therefore, consistent with suggestions in the literature (for example, Gong et al. 2012; Turok and McGranahan 2013) about how urbanisation potentially leads to improvements in living standards and increased access to utilities. Essentially, the findings and discussions generated a compelling narrative of how education is integral to the sustainable development of Kumasi and Obuasi, and how sustainable development in the two areas is potentially undermined by structural constraints, including poverty and inequality. In sum, the findings have shown that while the recent improvements in human development and well-being in Ghana, as represented by the HDI (See Chapter Four), has led to urban level (Kumasi and Obuasi) improvements in education, living standards, and health, the rapid pace of urbanisation in Kumasi and Obuasi could undermine the achievement of sustainable development targets in the two areas as conventional planning cannot keep pace with contemporary and future population growth. A key challenge will, therefore, be to recognise the bi-directional relationship between sustainability and urbanisation in order to provide adaptive solutions to the sustainability challenges in Obuasi and Kumasi due to rapid urbanisation.

5.4 An analysis of citizens' perceptions on dimensions of and attitudes towards urban sustainability in Kumasi and Obuasi

5.4.1 Demographic summary.

A valid total of 620 (out of 624) questionnaires administered in Kumasi (n = 318) and Obuasi (n= 302) were analysed. The summary of the demographic variables is shown in Table 5.11. The table shows that a small majority of respondents in Kumasi and Obuasi were female, while the rest were male. A greater number of respondents in Kumasi (39.0%) and Obuasi (42.7%) had been residents for more than ten years. The proportion of 'unemployed' respondents was approximately 40% for both Kumasi and Obuasi, with the remainder either 'employed with wage' or 'self-employed'. The proportion of respondents without formal education was 2.5% in Kumasi and 3.6% in Obuasi, with the remainder educated up to tertiary level. These numbers are comparable to the demographic distributions recorded in the 2010 Census for the study sites (Ghana Statistical Service 2014b; 2014c).

Table 5.11: Demographic summary of questionnaires (valid) administered in Kumasi and Obuasi.

Category	**Location**			
Gender	***Kumasi***	***%***	***Obuasi***	***%***
Female	172	54.10	157	52.00
Male	146	45.90	145	48.00
Age (years)	***Kumasi***	***%***	***Obuasi***	***%***
18 - 30	139	43.70	126	41.70
31 - 45	113	35.50	97	32.10
46 - 60	51	16.00	57	18.90
> 60	15	4.70	22	7.30
Length of Residence	***Kumasi***	***%***	***Obuasi***	***%***
< 2	0	0	0	0
2 - 5	80	25.20	65	21.50
6 - 10	114	35.80	108	35.80
> 10	124	39.00	129	42.70
Level of Education	***Kumasi***	***%***	***Obuasi***	***%***
None	8	2.50	11	3.60
Primary	101	31.80	141	46.70
Secondary	128	40.30	95	31.50
Tertiary	81	25.50	55	18.20
Employment Status	***Kumasi***	***%***	***Obuasi***	***%***
Employed with wage	47	14.80	51	16.90
Self-employed	145	45.60	131	43.40
Unemployed / Retired	126	39.60	120	39.70

5.4.2 Perceptions of the dimensions of sustainability and urbanisation.

5.4.2.1 Citizens' perceptions of economic sustainability statements.

The criteria for citizens' perceptions on economic sustainability included in the survey were income levels, cost of goods and services, and ease of employment. Table 5.12 shows the distribution of responses given to the statements on economic sustainability. The dominant observation made from Table 5.12 is that the perception of respondents on economic sustainability in both Kumasi and Obuasi is negative. For example, in terms of ease of finding a job (Q1), an overwhelming majority of respondents (Kumasi=84.5%; Obuasi=88.7%) disagreed or strongly disagreed with the statement.

Table 5.2: Distribution of responses for perceptions on economic sustainability statements.

Statement	**Ranking**	**Kumasi (%)**	**Obuasi (%)**
Q1. It is easy to find a job.	Strongly disagree	24.5	20.5
	Disagree	60.1	68.2
	Undecided	13.8	7.9
	Agree	1.6	3.3
	Strongly agree	0	0
Q2. The cost of goods and services are acceptable (compared to elsewhere in Ashanti).	Strongly disagree	20.1	15.6
	Disagree	52.2	32.1
	Undecided	21.4	50.3
	Agree	6.3	2.0
	Strongly agree	0	0
Q3. Income levels are adequate (compared to elsewhere in Ashanti).	Strongly disagree	6.6	9.6
	Disagree	25.5	51.3
	Undecided	21.4	25.5
	Agree	44.0	12.6
	Strongly Agree	2.0	1.0

5.4.2.2 Citizens' perceptions of social sustainability statements.

Respondents were asked about their perceptions on statements which centred on the adequacy of access to education, healthcare, transport, housing, as well as their views on the level of public safety. Table 5.14 shows the distribution of responses given to the statements on social sustainability. Responses were mixed; however, notable observations were made. For example, 73.2% of respondents in Obuasi agreed or strongly agreed that public safety levels were acceptable, compared with 7.2% in Kumasi. Also, compared to variables such as healthcare (Kumasi=13.8%, Obuasi=12%) and housing (Kumasi=9.7%, Obuasi=13.6%) where less than 15% of respondents in both locations agreed or strongly agreed, a significant proportion of respondents (Kumasi=71.1%, Obuasi=36.0%) agreed or strongly agreed with the statement on access to education (Q4).

Table 5.3: Distribution of responses for perceptions on social sustainability statements.

Statement	Ranking	Kumasi (%)	Obuasi (%)
Q4. Access to education is adequate.	Strongly disagree	0.6	3.0
	Disagree	14.2	40.1
	Undecided	14.2	21.5
	Agree	60.4	30.5
	Strongly agree	10.7	5.5
Q5. Access to healthcare is adequate.	Strongly disagree	13.2	13.6
	Disagree	49.7	38.7
	Undecided	23.3	35.8
	Agree	13.8	11.3
	Strongly agree	0	0.7
Q6. Access to housing is adequate.	Strongly disagree	15.1	7.0
	Disagree	56.0	48.3
	Undecided	18.2	31.1
	Agree	9.7	13.6
	Strongly agree	0.9	0
Q7. Public transport is widely available.	Strongly disagree	1.9	2.0
	Disagree	38.4	15.2
	Undecided	19.8	8.3
	Agree	39.6	60.6
	Strongly agree	0.3	13.9
Q8. Public safety levels are acceptable.	Strongly disagree	20.1	7.6
	Disagree	56.9	12.6
	Undecided	15.7	6.6
	Agree	6.9	31.1
	Strongly Agree	0.3	42.1

5.4.2.3 Citizens' perceptions of environmental sustainability statements.

Respondents were asked about their perceptions on statements which centred on the adequacy of access to potable water, sanitation, and green spaces, as well as their views on

air pollution and recycling. Table 5.15 shows the distribution of responses given to the statements on environmental sustainability. Responses were mixed; however, notable observations were made. For example, a tiny proportion of respondents (Kumasi=7.2%, Obuasi=4.0%) agreed or strongly agreed on the acceptability of air pollution levels (Q9); however, as an indication of the degree of seriousness of the situation in either place, 9.1% of respondents in Kumasi strongly disagreed compared with Obuasi where a significantly higher number of respondents (32.1%) strongly disagreed. Similarly, there were disparities in responses from Kumasi and Obuasi with respect to access to potable water (Q12). For example, a combined 5.6% (Obuasi) and 33.6% (Kumasi) expressed agreement or strong agreement with the statement on access to potable water, compared with 79.8% (Obuasi) and 46.8% (Kumasi) who expressed disagreement or strong disagreement. The prominence of the disparity between the two cities is the level of strong disagreement, where 0.3% of respondents in Kumasi expressed strong disagreement compared with 22.5% in Obuasi.

Table 5.4: Distributions of responses for perceptions on environmental sustainability statements.

Statement	Ranking	Kumasi (%)	Obuasi (%)
Q9. The level of air quality or pollution is acceptable.	Strongly disagree	9.1	32.1
	Disagree	55.7	55.3
	Undecided	28.0	8.6
	Agree	7.2	4.0
	Strongly agree	0	0
Q10. The amount of accessible green and public spaces is adequate.	Strongly disagree	8.2	26.5
	Disagree	39.6	36.1
	Undecided	34.6	32.5
	Agree	17.6	5.0
	Strongly agree	0	0
Q11. The levels of sanitation service provision and general cleanliness are adequate.	Strongly disagree	19.6	18.9
	Disagree	59.6	46.4
	Undecided	13.6	32.5
	Agree	7.2	2.3
	Strongly agree	0	0
Q.12. There is good access to potable water.	Strongly disagree	0.3	22.5
	Disagree	46.5	57.3
	Undecided	19.2	14.6
	Agree	33.3	5.6
	Strongly agree	0.3	0
Q.13. Recycling and re-use of waste materials are important to save the environment.	Strongly disagree	0.3	0.3
	Disagree	0.9	1.3
	Undecided	12.9	10.6
	Agree	68.9	70.9
	Strongly agree	17.0	16.9

5.4.2.4 Citizens' perceptions of urbanisation statements.

The respondents were asked about their perceptions on statements which centred on the urbanisation process, whether it is commensurate with the level of development, how it has affected their access to socio-economic opportunities, and whether they were content with being in their current city. Table 5.16 shows the distribution of responses given to the statements on urbanisation. Responses were mixed; however, notable observations were made. There was a general awareness among respondents about the urbanisation process as over 45% of respondents in both Kumasi and Obuasi agreed or strongly agreed with the statement on the rapidly changing urban landscape (Q14); while over 60% of respondents in both areas did not think that urbanisation rates were commensurate with the level of development (Q15). With respect to access to socio-economic opportunities (Q16), a combined 49.7% (Kumasi) and 54.0% (Obuasi) of respondents disagreed or strongly disagreed, and at the same time, a combined 24.4% (Kumasi) agreed to the statement compared with Obuasi where 9% of respondents agreed.

Table 5.5: Distribution of responses for perceptions on urbanisation statements.

Statement	Ranking	Kumasi (%)	Obuasi (%)
Q.14 The city's population and landscape are changing rapidly.	Strongly disagree	0	2.0
	Disagree	7.2	27.8
	Undecided	16.4	25.2
	Agree	52.2	31.5
	Strongly agree	24.2	13.6
Q15. The rate of urbanisation is commensurate with the level of development.	Strongly disagree	10.4	11.3
	Disagree	59.1	50.3
	Undecided	26.4	37.4
	Agree	3.8	1.0
	Strongly agree	0.3	0
Q16. There is great access to economic opportunities, essential infrastructure and services from where I live in this city.	Strongly disagree	9.4	9.6
	Disagree	40.3	45.4
	Undecided	29.9	35.1
	Agree	20.4	9.9
	Strongly agree	0	0
Q.17 I am happy to live in this city and I do not seek to migrate to another place in this country.	Strongly disagree	9.1	6.3
	Agree	28.6	35.8
	Undecided	27.4	23.2
	Agree	28.3	27.8
	Strongly agree	6.6	7.0

5.4.3 Attitudes towards urban sustainability.

In order to explore the roles and opportunities for promoting urban sustainability in the context of urban citizens, the attitudes of respondents, in terms of willingness to commit to widely accepted practices that promote sustainability, such as waste recycling, patronising public transport, and resource (water, energy) conservation, were examined. The results presented in Figure 5.13 and Figure 5.14 show that there is a clear trend of positive attitudes towards pro-sustainability practices amongst respondents in both Kumasi and Obuasi. The results showed that aside from the 'willingness to recycle waste' category where respondents

in Obuasi showed greater relative willingness, the respondents in Kumasi were marginally more willing to commit to pro-sustainability behaviour in the other categories. For example, in Kumasi, 80.1% (n=255) of respondents indicated their willingness to recycle, with the remaining 19.9% (n=63) selecting 'maybe' as an answer; compared with Obuasi where 90% (n=272) answered yes, 9% (n=27) answered 'maybe' and the remaining 1% (n=3) answered 'no'. For the other categories, 81% (n=257) answered yes, 14% (n=45) answered maybe, and 5% (n=6) answered 'no' in Kumasi, to the question of whether they were willing to patronise public transport; compared with Obuasi where 81% (n=239) answered 'yes', 14% (n=51) answered 'maybe', and 5% (n=12) answered 'no'. Also, with respect to water conservation, 93.4% (n=297) answered 'yes', and the remaining 6.6% (n=21) answered 'maybe' in Kumasi, compared with Obuasi where 91.4% (n=276) answered 'yes', and the remaining 8.6% (n=26) answered 'maybe'. Finally, with respect to energy conservation, 92.1% (n=293) answered 'yes', and the remaining 7.9% (n=25) answered 'maybe' in Kumasi, compared with Obuasi where 86.8% (n=262) answered 'yes', 12.9% (n=39) answered 'maybe' and the remaining 0.3% (n=1) answered 'no'. Despite the differences, the result showed that overall, there is a positive attitude towards pro-sustainability behaviour in both areas.

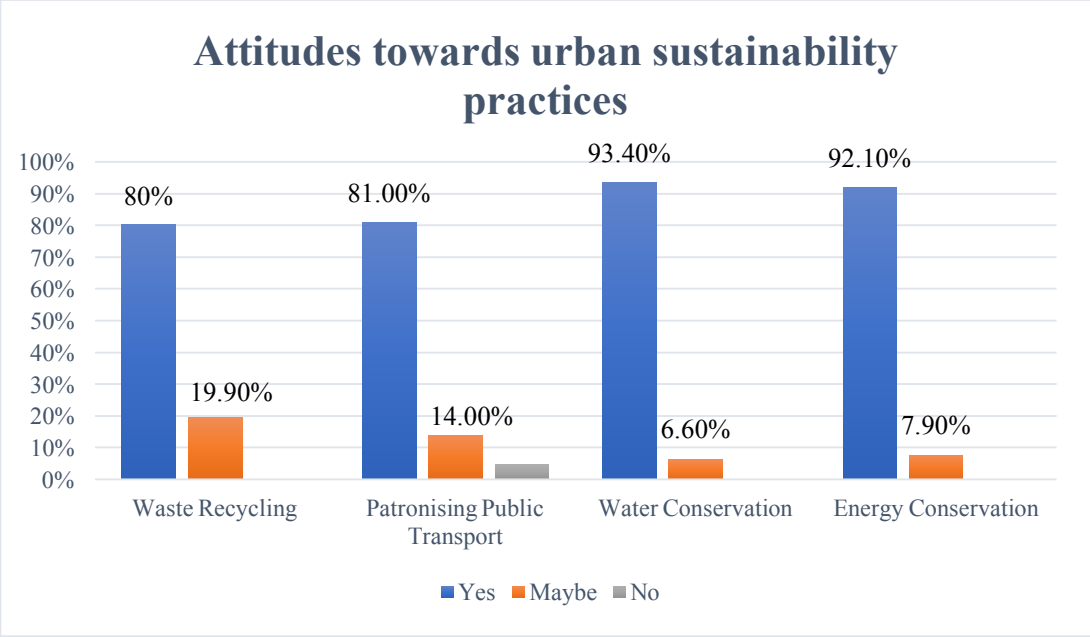

Figure 5.13: Attitudes towards urban sustainability practices in Kumasi.

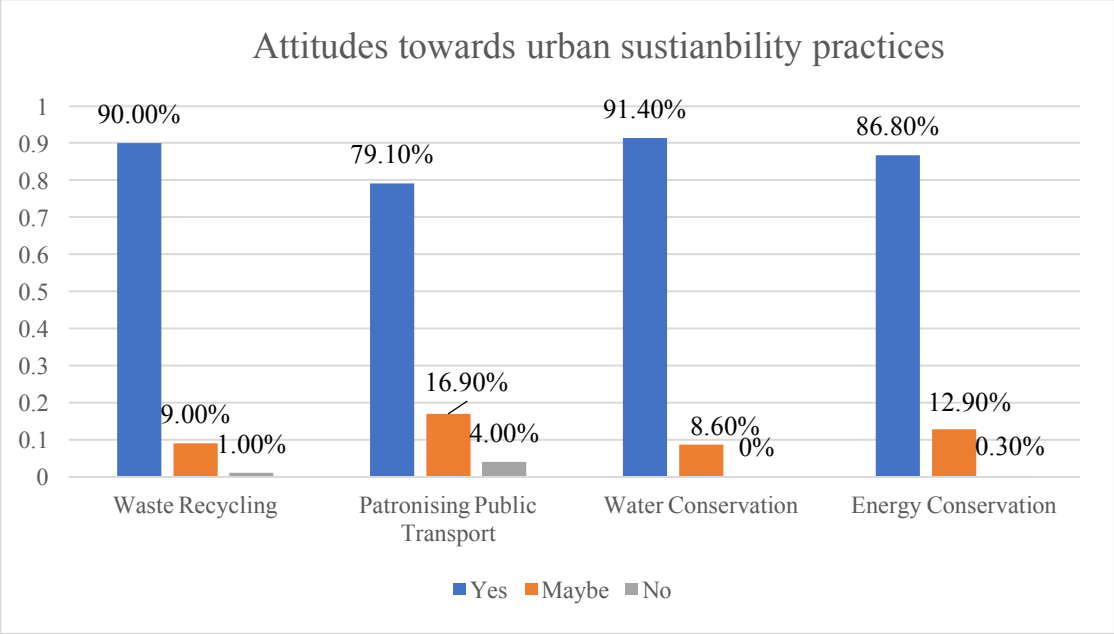

Figure 5.14: Attitudes towards urban sustainability practices in Obuasi.

5.4.4 Group differences in sustainability perception.

5.4.4.1 Gender differences in citizens' perceptions of sustainability statements.

The Mann-Whitney U test results for statements which fulfilled test assumptions (see Chapter Three) for gender differences in citizens' responses in Kumasi are summarised in Table 5.17. The table details the mean rank scores, U, Z and p-values produced by the Mann-Whitney U-test and the decision reached on whether to reject or accept the H_o as evidence of gender difference association. From Table 5.17, statistically-significant interactions in gender differences were found for Q5, Q11 and Q15. Specifically, the Mann-Whitney U-test showed that perceptions on Q5 (Access to healthcare is adequate) were greater for females (mean rank=169.79) than for males (mean rank=147.38), U=10786.00, z=-2.336, p=0.019. For Q11 (The levels of sanitation service provision and general cleanliness are adequate), the Mann-Whitney U-test showed that perceptions on Q11 were greater for females (mean rank=168.50) than for males (mean rank=147.73), U=10836.00, z=-2.279, p=0.023. For Q15 (The rate of urbanisation is commensurate with the level of development), the Mann-Whitney U-test showed that perceptions on Q15 were greater for females (mean ran=168.65) than for males (mean rank=148.73), U=10893.00, z=-2.189, p=0.029. Therefore, the null hypothesis (H_o) is rejected for Q5, Q11, and Q15. No statistically significant interactions were found for

gender difference in the other perception statements in Table 5.17; therefore, H_o was accepted for all of them.

Table 5.6: Mann-Whitney U test results for responses in Kumasi

Statement	**Mean Rank**		**Test Statistic**			**H_o Decision**
	Male	*Female*	*U*	*Z*	*P*	
Q1	*152.44*	*165.49*	*11525.00*	*-1.442*	*0.149*	*Accept*
Q2	*154.70*	*163.58*	*11855.00*	*-0.936*	*0.349*	*Accept*
Q5	*147.38*	*169.79*	*10786.00*	*-2.336*	*0.019*	***Reject***
Q6	*156.34*	*162.18*	*12095.00*	*-0.625*	*0.532*	*Accept*
Q8	*158.00*	*160.77*	*12337.00*	*-0.299*	*0.765*	*Accept*
Q9	*160.21*	*158.90*	*12452.00*	*-0.142*	*0.887*	*Accept*
Q11	*147.73*	*168.50*	*10836.00*	*-2.279*	*0.023*	***Reject***
Q12	*156.25*	*161.32*	*12071.00*	*-0.531*	*0.595*	*Accept*
Q15	*148.73*	*168.65*	*10893.00*	*-2.189*	*0.029*	***Reject***
Q16	*154.97*	*163.35*	*11894.50*	*-0.854*	*0.393*	*Accept*

The Mann-Whitney U test results for gender differences in citizens' responses to statements which fulfilled the test's assumptions (see Chapter Three) in Obuasi are summarised in Table 5.18. From Table 5.18, although there were differences in the mean rank scores for males and females, no statistically significant interactions were recorded. Hence, H_o was accepted for all the statements.

Table 5.7: Mann-Whitney U test results for responses in Obuasi.

Statement	Mean Rank		Test Statistic			H_o Decision
	Male	*Female*	*U*	*Z*	*P*	
Q1	*148.94*	*153.86*	*11011.55*	*-0.596*	*0.551*	*Accept*
Q5	*144.58*	*157.89*	*10378.50*	*-1.402*	*0.161*	*Accept*
Q6	*149.14*	*153.68*	*11040.50*	*-0.488*	*0.625*	*Accept*
Q9	*142.56*	*153.68*	*10086.00*	*-1.1915*	*0.055*	*Accept*
Q12	*142.98*	*159.37*	*10147.00*	*-1.825*	*0.068*	*Accept*
Q16	*157.88*	*145.61*	*10458.00*	*-1.314*	*0.189*	*Accept*

5.4.4.2 Sustainability perception by economic (employment) status.

The Kruskal-Wallis H tests for economic group differences in Kumasi are summarised in Table 5.19. Statistically-significant differences based on economic status were found in only two variables out of the total of nine which fulfilled the assumptions (see Chapter Three) of the Kruskal-Wallis H test for which H_o was rejected. These variables were Q1 (It is easy to find a job) and Q2 (The cost of goods and services are acceptable, compared to elsewhere in Ashanti). For Q1, a Kruskal Wallis H test found a statistically significant difference between economic groups, X_2 (2) = 40.694, p <0.001, with mean ranks of 188.07 for 'Employed with wage', 181.01 for 'Self-employed' and 124.09 for 'Unemployed'. For Q2, the Kruskal Wallis H test found significant difference between group responses, X_2 (2) =11.191, p=0.004, with mean ranks of 153.97 for 'Employed with wage', 176.33 for 'Self-employed' and 142.48 for 'Unemployed'.

Table 5.8: Kruskal-Wallis H test results for group differences (economic) in responses in Kumasi.

Statement	Mean Rank			Test Statistic		H_o Decision
	Employed with wage	*Self-employed*	*Unemployed*	*H (X^2)*	*P*	
Q1	188.07	181.01	124.09	40.694	<0.001	***Reject***
Q2	153.22	176.33	142.48	11.191	0.004	***Reject***
Q5	156.97	170.02	148.34	4.407	0.110	*Accept*
Q6	148.11	163.35	159.32	1.119	0.549	*Accept*
Q8	162.80	164.49	152.52	1.511	0.470	*Accept*
Q9	157.09	162.01	157.51	0.249	0.883	*Accept*
Q11	157.50	167.12	150.20	2.972	0.226	*Accept*
Q12	154.18	163.63	155.51	0.795	0.672	*Accept*
Q15	145.46	168.12	154.82	3.487	0.175	*Accept*

Further comparisons were made to ascertain whether the differences in perception due to economic status were polarised towards certain economic groups. These are attached in Appendix 7. As the findings show, in Kumasi, no statistically-significant relationships were found for group differences in perceptions between respondents who were 'Employed with wage' and 'Self-employed' respondents in relation to Q1 (X_2 [1] = 0.209, p=0.648) and Q2 (X_2 [1] = 2.463, p=0.117), while statistically significant relationships were found for differences in perceptions between 'Self-employed' and 'Unemployed' in relation to Q1 (X_2 [1] = 32.688, p=<0.001) and Q2 (X_2 [1] = 10.918, p=0.001). For the difference between 'Employed with wage' and 'Unemployed', statistically significant differences were found for Q1 (X_2 [1] = 22.393, p < 0.001), while no statistically significant relationships were found for Q2 (X_2 [1] = 0.565, p = 0.452). This shows that even within the groups, economic group effects were more influenced by the perceptions of the 'Unemployed' group in Kumasi.

Table 5.20 summarises the Kruskal-Wallis H test for economic group differences in Obuasi. The findings showed group differences regarding two variables only. These variables were Q1 (It is easy to find a job) and Q16 (There is great access to economic opportunities, essential infrastructure and services from where I live in this city). For Q1, a Kruskal Wallis

H test found a statistically significant difference between economic groups, X^2 (2) = 38.487, p <0.001, with mean ranks of 202.38 for 'Employed with wage', 153.06 for 'Self-employed and 128.18 for 'Unemployed'. For Q16, the Kruskal Wallis H test found a significant difference between group responses, $X^2(2) = 10.599$, p= 0.005, with mean ranks of 162.89 for 'Employed with wage', 164.19 for 'Self-employed' and 132.81 for 'Unemployed'. Thus, H_o was rejected for Q1 and Q16 and accepted for the remaining variables.

Table 5.9: Kruskal-Wallis H test results for group differences (economic) in responses in Obuasi.

Statement	**Mean Rank**			**Test Statistic**		**H_o Decision**
	Employed with wage	*Self-employed*	*Unemployed*	*H (X^2)*	*P*	
Q1	*202.38*	*153.38*	*128.18*	*38.487*	*<0.001*	***Reject***
Q5	*165.04*	*154.18*	*142.82*	*2.843*	*0.241*	*Accept*
Q6	*157.97*	*154.79*	*145.16*	*1.287*	*0.526*	*Accept*
Q9	*151.69*	*147.43*	*155.86*	*0.733*	*0.693*	*Accept*
Q12	*144.50*	*146.06*	*160.41*	*2.616*	*0.270*	*Accept*
Q16	*162.89*	*164.19*	*132.81*	*10.599*	*0.005*	***Reject***

Further comparisons were made to ascertain whether the differences in perception due to economic status were polarised towards specific economic groups. These are attached in Appendix 8. As the findings show, in Obuasi, statistically-significant relationships were found for group differences in perceptions between respondents who were 'Employed with wage' and 'Self-employed' in relation to Q1 (X_2 [1] = 19.400, p<0.001), while no statistically significant relationship was found for Q16 (X_2 [1] = 0.037, p=0.847). Statistically significant relationships were found for differences in perceptions between 'Self-employed' and 'Unemployed' respondents in relation to Q1 (X_2 [1] = 9.083, p=0.003) and Q2 (X_2 [1] = 8.948, p=0.003). For the difference between 'Employed with wage' and 'Unemployed', statistically significant differences were found for Q1 (X_2 [1] = 31.772, p<0.001) and Q16 (X_2 [1] = 5.504, p=0.019). Similar to Kumasi, results show that economic group effects were more influenced by the perceptions of the 'Unemployed' group in Obuasi.

5.4.4.3 Sustainability perception by age (years) of respondents.

The Kruskal-Wallis H tests for differences in responses based on age (years) group in Kumasi and Obuasi are summarised in Table 5.21. and Table 5.23 respectively. For Kumasi, it is seen (Table 5.21) that a statistically significant relationship was only found for Q17 (I am happy to live in this city and I do not intend to migrate to another place in this country) out of all the statements which fulfilled the assumptions of the Kruskal-Wallis H test. As a result, Ho was rejected for Q17 and accepted for the other statements in Table 5.21. In order to determine whether differences in perceptions on Q17 (based on age) were influenced by certain age groups in Kumasi, the groups were paired and the Kruskal-Wallis H test was repeated for paired age group interactions. The results (see Appendix 9) showed statistically significant interactions in all the age group pairings. In order to further ascertain which age groups contributed most to the differences in perceptions for Q17, the effect size (= H / n-1), which shows the magnitude of interactions, was calculated (Table 5.22). From Table 5.22, the largest effect size (0.182) for Q17 in Kumasi emerged from the interactions between '18 – 30' and '> 60' age groups, while the smallest effect size (0.039) emerged from the interactions between '18-30' and '31-45' age groups. This indicates that the interactions between the youngest age group ('18 -30') and the eldest age group ('> 60') contributed more (18.2%) to the differences in perceptions due to age for Q17 in Kumasi. As shown in Table 5.23, H_o was accepted for all the statements tested based on age group in Obuasi because no statistically significant interactions were found.

Table 5.10: Kruskal-Wallis H test results for differences in responses based on age (years) group in Kumasi.

Statement	Mean Rank				Test Statistic		H_o Decision
	18 – 30	*31– 45*	*46 – 60*	*> 60*	*H (X^2)*	*P*	
Q2	157.36	163.60	155.07	163.50	0.532	0.912	*Accept*
Q3	150.12	163.72	171.44	174.07	3.292	0.349	*Accept*
Q5	157.51	173.82	143.93	123.03	7.709	0.052	*Accept*
Q6	157.91	158.73	170.62	142.27	1.624	0.654	*Accept*
Q7	163.71	157.46	144.86	185.60	3.261	0.353	*Accept*
Q8	159.45	161.31	157.38	153.60	0.165	0.983	*Accept*
Q9	155.39	167.07	158.65	143.47	1.870	0.600	*Accept*
Q11	151.65	172.71	154.80	139.00	5.427	0.143	*Accept*
Q12	156.81	167.83	156.61	121.47	4.299	0.231	*Accept*
Q13	159.60	158.18	150.11	200.50	5.310	0.150	*Accept*
Q14	145.14	170.22	168.03	182.80	7.542	0.056	*Accept*
Q15	160.27	169.57	144.72	126.73	5.931	53.549	*Accept*
Q17	128.44	161.80	208.02	265.10	0.115	<0.001	***Reject***

Table 5.11: Effect size for age group differences in perceptions in Kumasi for Q17.

Group Interaction	Effect Size
’18 – 30’ and ’31 – 45’	***0.039***
’18 – 30’ and ’46 – 60’	***0.155***
‘18 – 30’ and ‘> 60’	***0.182***
‘31 – 45’ and ‘46 – 60’	***0.065***
‘31 – 45’ and ‘> 60’	***0.175***
‘46 – 60’ and ‘> 60’	***0.119***

Table 5.12: Kruskal-Wallis H test results for differences in responses based on age group in Obuasi.

Statement	Mean Rank				Test Statistic		H_o Decision
	18 – 30	*31 – 45*	*46 – 60*	*> 60*	*H (X^2)*	*P*	
Q1	147.96	147.29	161.41	164.64	2.471	0.480	*Accept*
Q3	155.23	150.16	148.07	144.95	0.549	0.908	*Accept*
Q6	165.51	145.23	136.65	149.52	6.984	0.072	*Accept*
Q7	155.17	140.10	163.54	149.52	3.854	0.278	*Accept*
Q8	148.97	144.77	162.66	166.73	2.555	0.465	*Accept*
Q9	147.74	154.65	150.47	161.80	0.845	0.839	*Accept*
Q10	156.34	150.11	151.90	128.86	2.101	0.552	*Accept*
Q11	148.51	146.69	159.16	170.02	2.177	0.537	*Accept*
Q12	155.08	136.27	171.11	147.34	7.630	0.054	*Accept*
Q13	145.33	159.05	154.80	144.98	2.441	0.486	*Accept*
Q14	142.30	165.75	149.11	147.59	4.380	0.223	*Accept*
Q15	153.56	142.90	169.06	132.16	5.369	0.147	*Accept*
Q16	146.06	147.80	156.63	185.68	4.911	0.178	*Accept*

5.4.4.4 Sustainability perception by level of education of respondents.

The Kruskal-Wallis H tests for differences in responses based on level of education in Kumasi and Obuasi are summarised in Table 5.24 and Table 5.25 respectively. The tables show that there were no statistically-significant interactions in responses (based on level of education) for all the statements which fulfilled the assumptions of the Kruskal-Wallis H test in Kumasi and Obuasi. As a result, H_o was accepted for all the statements in Tables 5.24 -25.

Table 5.13: Kruskal-Wallis H test results for differences in responses based on level of education in Kumasi.

Statement	Mean Rank				Test Statistic		H_o Decision
	None	*Primary*	*Secondary*	*Tertiary*	*H (X^2)*	*P*	
Q1	123.56	168.04	153.27	162.24	3.596	0.309	*Accept*
Q3	192.19	149.68	160.98	166.18	2.955	0.399	*Accept*
Q5	150.50	167.36	156.07	156.01	1.291	0.731	*Accept*
Q6	152.88	171.54	149.62	160.75	4.012	0.260	*Accept*
Q7	160.75	169.68	152.81	157.25	2.251	0.522	*Accept*
Q9	174.88	158.88	158.88	160.17	0.305	0.959	*Accept*
Q10	174.50	146.33	167.78	161.35	3.769	0.288	*Accept*
Q12	148.63	163.70	155.54	159.58	0.647	0.886	*Accept*
Q13	172.06	151.47	166.27	157.57	2.476	0.480	*Accept*
Q14	156.94	170.41	157.48	149.35	2.953	0.399	*Accept*
Q16	126.56	152.05	174.78	147.90	7.247	0.064	*Accept*
Q17	148.75	168.99	158.83	149.79	2.246	0.523	*Accept*

Table 5.14: Kruskal-Wallis H test results for differences in responses based on level of education in Obuasi.

Statement	Mean Rank				Test Statistic		H_o Decision
	None	*Primary*	*Secondary*	*Tertiary*	*H (X^2)*	*P*	
Q5	134.64	149.12	151.01	161.82	1.441	0.696	*Accept*
Q6	166.09	142.71	154.59	165.78	3.896	0.273	*Accept*
Q7	164.09	155.39	154.22	134.31	3.545	0.315	*Accept*
Q9	141.77	150.26	150.47	158.39	0.653	0.884	*Accept*
Q10	138.27	149.64	157.59	148.40	0.942	0.815	*Accept*
Q11	133.09	155.37	145.93	154.89	1.436	0.697	*Accept*
Q12	163.77	152.00	150.65	149.24	0.336	0.953	*Accept*
Q13	134.18	143.59	157.76	164.44	5.150	0.161	*Accept*
Q14	137.68	142.57	157.24	167.23	4.246	0.236	*Accept*
Q16	173.95	152.58	149.33	147.98	1.041	0.791	*Accept*

5.4.5 General comments by citizens.

Details of the comments made by citizens which were recorded in the extra space provided at the end of the questionnaire are attached in Appendix 3. Overall, fifteen of the 'further comments' (six in Obuasi and nine in Kumasi) provided by the participants were deemed relevant to the current conversation. The statements highlighted how socio-economic considerations dominantly shaped the perceptions of citizens, sometimes, at the expense of environmental considerations. For example, a participant in Obuasi (ID: O304) said that *"I used to engage in 'galamsey'*[12]*, but there has been a clamp down by the government and the company [AngloGold Ashanti] due to environmental concerns and the fact that the land belongs to the company. But what should we do since there are no jobs? I know 'galamsey' destroys the land and water [environment] but what choice do have when 'galamsey' is the only means through which we can survive".* Similarly, a participant in Kumasi (ID: K727) said that *"I understand the fact that you are sensitising us on the things we could do to promote good development. However, if we want to recycle our waste where do we send it? We can only do it if adequate provisions are made. These days, in order to be able to go to work you must buy a car if you can afford it. The 'trotro' [public transport] is unreliable and you spend a lot time waiting it".*

5.4.6 Discussion.

5.4.6.1 Perceptions of sustainability and urbanisation dimensions.

(a) Economic sustainability dimensions.

The state of the economy is always going to be an important consideration when exploring the overall well-being of urban citizens in the context of sustainability. The literature (see, for example, Bell and Blanchflower 2010; OECD 2013) emphasised how unemployment can impact negatively on the livelihoods of urban citizens, a situation which is particularly damaging for vulnerable groups such as the physically-challenged and the elderly. The findings presented in Table 5.13 attest to those realities as most responses in Kumasi and Obuasi on the economic statements expressed a general pessimism on the representations of the economy. The prevailing opinion was that difficulties exist in securing employment. For

12 Galamsey is the local name in Ghana for small-scale mining activities (mostly illegal) where the top soil of ore-rich land is excavated and chemicals including mercury are used to extract the mineral ore (Azumah et al. 2019).

example, when asked for their perception of how easy it is to find a job (Q1), 84.5% of respondents in Kumasi disagreed or strongly disagreed, compared with 88.7% in Obuasi. Differences in perceptions among respondents emerged in the question about whether income levels were acceptable (Q3), for which 46% of respondents in Kumasi agreed or strongly agreed compared with 13.6% of respondents in Obuasi who agreed or strongly agreed. In order to explain these observations, it is argued that while urban unemployment is pervasive in Ghana (see Section 4.2), consistent with the literature (see, for example, Ferguson 1999; David and Arman 2014), it is the local economic context that has underpinned respondents' perceptions of the economy in both areas. For example, at the time of the study, Obuasi, whose urbanisation is mainly premised on its mineral extraction links, was struggling economically. This is because of the down-turn in operations of AngloGold Ashanti's mine, the mainstay of the local economy. The mine was closed in 2014 and re-opened in 2019 (Ghana Chamber of Mines 2019). The implications of the mine's closure on the local economy were the loss of jobs and livelihoods for the various citizens, as well as the impact on the various sectors of the local economy. Thus, the views of respondents in Obuasi reflect the economic vulnerability of resource-based cities like Obuasi which depend on the economic empowerment opportunities provided by companies such as AngloGold Ashanti. However, the relatively better perception of the economy by respondents in Kumasi may be attributed to Kumasi's primacy regionally and nationally. Kumasi's primacy means that the city is likely to attract more substantial resources and opportunities including jobs and investments. Furthermore, Kumasi's primacy means that it wields significant administrative and political powers which potentially influence economic decisions in its favour. Overall, the perceptions of citizen on the economy are the implications of the findings in Section 5.2 which demonstrated that the populations in Kumasi and Obuasi have expanded by at least three times since 1984, and as the literature suggests (see, for example, Frank 1968), a burgeoning urban population in a less-developed country such as Ghana means that the demand for jobs exceeds supply, making urban unemployment widespread.

(b) Social sustainability dimensions.

From a human well-being perspective, the raison d'etre underpinning all sustainability-related policies and projects is to provide opportunities for citizens to meet their basic needs (see, for example, WCED 1987). Thus, the findings presented in Table 5.14 explored the views of citizens on selected statements on social sustainability. By considering the distribution of citizens' responses to statements on access to social goods such as education

and healthcare (as shown in Table 5.14), the responses of respondents in Kumasi and Obuasi were remarkably similar for some statements and disparate in others. For example, on the statement concerning access to health (Q5), a combined 62.9% in Kumasi disagreed or strongly disagreed, compared with 52.3% in Obuasi. Significant disparities emerged in responses on public safety (Q8) where only 7.2% of respondents in Kumasi agreed or strongly agreed that public safety levels were adequate, compared with 73.2% in Obuasi. Possible explanations for these disparities can be given in the context of city size and population pressures. For example, except for the existence of the gold mine which has diversified the community make-up of Obuasi and shaped its urbanisation, it is typically an agrarian area where residents have lived in proximity with each other. In contrast, Kumasi's population is ten times that of Obuasi (Ghana Statistical Service 2019), and the evidence previously presented (See Section 5.2) has shown that the migrant population in Kumasi (53%) is higher than in Obuasi (38%). This has implications for public safety as the literature (see, for example, Opoku-Mensah and Asare-Okyere 2014) suggests that high populations potentially compromise social harmony. Therefore, it could be argued, based on this survey, as an exploratory test of social sustainability, that public safety is favourably evaluated in Obuasi compared with Kumasi. On the whole, despite the specific differences, an important pattern observed in Table 5.14 was that respondents in Kumasi and Obuasi were more alike than different with regard to perceptions concerning aspects of social sustainability.

(c) Environmental sustainability dimensions.

The findings in Table 5.15 showed unique differences in perceptions of the respective respondents with regard to environmental sustainability statements. For example, concerning air quality / pollution levels (Q9), the responses in Obuasi were unmistakably clear as 87.4% of respondents disagreed or strongly disagreed with the notion that the level of air quality was acceptable, compared with 64.8% in Kumasi. However, on paper, AngloGold Ashanti, for most parts of its operations, is reported to have developed a relatively healthy control and oversight mechanism to monitor and deal with the pollution effects of its activities. Another observation is that, the respondents in Obuasi were more dismissive about potable water (Q12), as over 79.8% disagreed or strongly disagreed with the notion that access to potable water was adequate; compared with Kumasi where 46.8% disagreed or strongly disagreed with the same notion. A possible explanation for this observation can be inferred from the well-documented pollution of water sources in Obuasi. For example, the literature (see ActionAid Report 2006; Foli et al. 2012) alludes to the arsenic contamination of water bodies

in the mining environs and how this affects the socio-economic development of the residents. While AngloGold Ashanti, through its corporate social responsibility activities, complements the Ghanaian government's political mandate to provide public goods such as potable water to the citizens in Obuasi, the findings indicate a serious lack of access to potable water. This again reflects the peculiarity of urban sustainability problems faced by resource-based urban communities. The findings also show a severe potable water access problem in Kumasi, which is not all that different in magnitude to that of Obuasi. For Kumasi, the reasons that can be inferred from Section 4.4.1 (see, for example, Amo et al. 2017) include the impacts of land use change, as well as population pressures which lead to the conversion of fragile land cover types such as water bodies and wetlands. Therefore, respondents' perceptions in the context of the environment, appear to corroborate evidence from Section 4.2, thereby suggesting that the manifestations of urban sustainability problems within the same regional geographic area can be drastic but also diverse.

(d) Citizens' awareness of urbanisation.

Across both study sites, citizens demonstrated their awareness of the demographic and landscape transformation brought about by the urbanisation process. As the literature suggests (see for example, Misilu et al. 2010; Page 2012; Miller 2014), urbanisation will either lead to the creation or reduction in socio-economic opportunities. The study also explored citizens' perceptions on their level of access to socio-economic opportunities. In all, the findings on perceptions of urbanisation presented in Table 5.16 generate three key observations. First, there is a general notion that urbanisation rates were not commensurate with the levels of development (Q15), as 69.5% of respondents in Kumasi and 61.6% of respondents in Obuasi disagreed or strongly disagreed with the statement. Second, the findings were an indication of the impact of urbanisation on the ability of citizens to meet their basic needs, as 49.7% of respondents in Kumasi and 55.0% of respondents in Obuasi disagreed or strongly disagreed that despite the rapidly changing urban landscape they still had good access to socio-economic opportunities and infrastructure (Q16). Differences, however, also existed as 20.4% of respondents in Kumasi agreed that they have access to socio-economic opportunities and infrastructure despite rapid urbanisation, compared with 9.9% of respondents in Obuasi. The final observation is that a relatively higher number of people in Obuasi (42.1%) were not happy to live in the city and were actively seeking to migrate to somewhere else in Ghana (Q17), compared with 37.7% in Kumasi. Essentially, the observations outlined above shed further light on the nature of the urbanisation process in the

study areas. They provide indirect evidence that despite the rapidly changing landscape and population boom, urbanisation has not happened in a way such that its inherent benefits are maximised to support the development of people.

5.4.6.2 Group differences in citizens' responses to sustainability statements.

(a) Gender differences in citizens' perceptions of sustainability.

Section 4.2 established the persistence of gender inequality in urban areas in Ghana (see for example, Awumbila 2006; Obeng-Odoom 2012; Danquah and Ohemeng 2017). Generally, gender differences in responses in Obuasi were weaker than Kumasi as no statistically-significant gender differences were found for all the statements tested in Obuasi. Statistically significant differences were found in some aspects of social and environmental sustainability in Kumasi; and also in some aspects of urbanisation. For example, the Mann-Whitney U-test showed that perceptions on Q5 (access to adequate healthcare) were greater for females (mean rank = 147.38) than for males (mean rank=169.79). While the scope of the survey did not include finding causal relationships, the gender differences in responses could be explained by reasons established in the literature (see, for example, Awumbila 2006; Danquah and Ohemeng 2017) which include, but are not limited to, poverty, cultural beliefs and traditions linked to gender-role expectations. These findings are also consistent with other scholars (for example, Tuncer 2008; Olsson and Gericke 2016) whose research reports differences in the perceptions of female and male respondents in sustainable development surveys. The findings are a clear indication that gender differences are important when seeking to understand the urban sustainability experience. The findings imply that women might be uniquely positioned to contribute to and lead efforts for urban sustainability. In this regard, urban sustainability-related policies must take into consideration women's potential penchant for pro-sustainability behaviour in order to effectively promote sustainability-related initiatives. Overall, the findings provide empirical support for the dominant idea in gendered sustainable development literature (Tuncer 2008; Olsson and Gericke 2016; Aina et al. 2019) that societal gender relations shape the extent to which people experience sustainable development and suggest that gender must be considered when making urban sustainability decisions.

(b) Differences in citizens' perceptions based on economic status.

The findings showed that a person's economic status could significantly affect their perception judgements. For example, in Kumasi (see Table 5.19), the Kruskal Wallis H test found significant difference between group responses for Q2 (Acceptability of cost of goods and services), with mean ranks of 153.97 for 'Employed with wage', 176.33 for 'Self-employed' and 142.48 for 'Unemployed'. In Obuasi, the Kruskal Wallis H test found a significant difference between group responses for Q16 (Access to economic opportunity and infrastructure), with mean ranks of 162.89 for 'Employed with wage', 164.19 for 'Self-employed' and 132.81 for 'Unemployed'. Further statistical tests were done to explore where the differences due to economic status were emanating from (see Appendices 6 and 7). Accordingly, in Obuasi, for example, statistically significant relationships were found for differences between 'Self-employed' and 'Unemployed' in relation to Q1 and Q2. For the difference between 'Employed with wage' and 'Unemployed', statistically significant differences were found for Q1 and Q16. Thus, the findings have shown that to some extent, a respondent's economic (employment) status influenced responses, especially when the contribution of economic opportunities to overall sustainable development is considered. This is consistent with the position in the literature (for example, Aina et al. 2019) that the socio-economic characteristics of respondents are strong determinants of their perceptions of sustainable development. Critically, the findings give an indication about the outcome for the urban poor in terms of the impacts of urbanisation. The reality that the group differences were more as a result of the responses of the economically inactive (unemployed) shows the harsher realities of urbanisation challenges on the urban poor. Consequently, the practical challenge is to design and develop sustainability-related policies and projects that cater for the needs of all citizens, while also being conscious of economic status-based vulnerabilities, especially among the urban poor. This is because the literature has thrown light on the challenges of the urban poor, especially slum dwellers, and how increasing inequality worsens their plights (Ghana Statistical Service 2007; Obeng-Odoom 2012). The discussion above shows how poverty challenges the country's SD progress (see, for example, Domfeh et al. 2012), and how the prevailing economic conditions determine the sustainability outcomes of urbanisation (Ferguson 1999; Davidson and Arman 2014).

(c) Differences in citizens' perceptions based on age and level of education.

The findings suggest that the level of education had no influence on the perceptions of citizens both within and across the urban areas studied. In terms of age group differences, the findings suggest that age group had no influence on the perceptions of respondents in Obuasi

as no statistically significant interactions were found for all the statements tested in Table 5.23. However, in Kumasi, age group of respondents explained differences in perception only to some extent as statistical significance was found in just one statement, Q17 (I am happy to live in this city and I do not intend to migrate to another place in this country), out of the thirteen statements tested (see Table 5.23). Age appears to be related to perceptions of citizens in Kumasi in relation to Q17, as despite the urban challenges in Ghana, the older generation (>60) seems to be more content and are not seeking to migrate, compared with the younger generation (18-30) who seem to be discontent with the overall state of urban development in Kumasi (see Table 5.22). The observation above could be explained in terms of aspects of urban challenges in Ghana, such as unemployment (see Section 4.2). The younger generation (18-30) who are not in employment, education or training might seem discontent with current urban development in Kumasi potentially because of the scarcity of employment opportunities. Therefore, they may aspire to migrate to other places in Ghana (or beyond) where there may be adequate economic opportunities for a better quality of life.

5.4.6.3 Willingness to engage in pro-sustainability practices.

On the whole, over 90% of respondents gave a favourable response to questions posed about their willingness to engage in pro-sustainability behaviour in both Kumasi and Obuasi. While the survey did not examine factors that may affect citizens' ability to engage in pro-sustainability behaviour and actual actions, the results suggest a generally favourable attitude towards sustainability. Based on the picture portrayed about the state of urban development in Ghana in Section 4.2, where urban poverty and inequality are pervasive, slums exist, and there is a scarcity of basic socio-economic infrastructure, a situation that is further exacerbated by rapid urbanisation (see Section 4.4); one might question the reasons underpinning the reported willingness of the respondents to engage in sustainable behaviour. It could be argued that the respondents were willing to conserve water and energy (electricity) because the provision and availability of these social or environmental resources are limited by their scarcity. Also, willingness to use public transport is explained by the reality that it may be the only available option (if available at all). Therefore, while the study did not explore the reasons why they would choose to engage in such behaviours, and considering the well-documented urban development problems presented in Section 4.2, the results imply that the need to promote urban sustainability by engaging in pro-sustainability behaviour currently resonates well with respondents, and they may potentially engage if

conditions permit. This is consistent with the assertion by Pappas and Pappas (2014) that there is the potential for sustainable action when the day-to-day behaviour of individuals are aligned to well-stated values. In sum, the results on respondents' attitudes towards pro-sustainability practices in Kumasi and Obuasi have shown that the selected practices were widely acceptable. This presents an opportunity to formulate policy, or if such is already available, to implement policies aimed at transforming these positive attitudes into normative sustainability behaviour in Ghanaian urban areas. Essentially, however, appropriate macro-conditions such as basic infrastructure (for example, kerbside recycling bins; public transit infrastructure) must also be provided if the implementation of such policies is to be successful.

5.4.6.4. General inference from citizens survey.

The urban sustainability dimensions explored in this study focused on the different dimensions of sustainability and attempted to represent the needs, values and priorities of the Ghanaian society as perceived from the review of the country's urban challenges (see Section 4.2). Although common interpretations of sustainability are premised on the integration of the different environmental, social, and economic dimensions (see, for example, Jeronen 2013), the findings have shown that the respondents' perceptions about sustainability are primarily influenced by their socio-economic circumstances, rather than a desire to witness any defined description of sustainability where environmental, social and economic goals are balanced. While the findings presented in Section 5.4.2 have shown the differences and similarities in the perceptions of respondents in Obuasi and Kumasi, the comments recorded in Appendix 3 and sampled in Section 5.4.5 succinctly capture the context within which the interactions between urbanisation and sustainability at the local urban level manifest from the perspective of citizens.

The general inference made from the comments is that as much as citizens recognised the various dimensions of sustainability in the context of urbanisation, their overall perceptions were shaped by their socio-economic circumstances. While there is certainly no basis for generalisation, what resonates throughout the comments is the tendency for citizens to prioritise issues concerned with basic socio-economic provisions, sometimes, over environmental concerns, in the midst of poverty. The survey of the subjective experiences of citizens, thus, corroborates the initial premise in this thesis on how poverty manifests and

uniquely shapes the urbanisation and sustainable development experience in the urban areas of SSA. Consequently, the findings presented in this chapter embed the understanding that the circumstances in SSA (in the context of national and citizen poverty) mean that perceptions and interpretations of urban sustainability at the local level potentially vary from the utopian conditions for urban sustainability suggested in the literature (see Section 2.3.3), albeit equally legitimate.

Overall, although the responses for Kumasi and Obuasi in Tables 5.13–5.16 were not tested for statistical significance, and despite the different local conditions in Kumasi and Obuasi, the findings suggest that there is more commonality among responses in the context of the dimensions of sustainability than might be suggested based on their respective geographic, administrative and macro-economic structures. This is evident from the pattern of identical responses on the level of agreement with the selected sustainability statements among respondents from both urban areas. This is because while Obuasi's economy is fundamentally based on mining-related activities compared with Kumasi's economy which is underpinned by commerce and service provision, the findings seem to suggest that there is potentially more agreement than previously thought. Furthermore, the findings give an indication of the trade-offs and mediating effects of the different dimensions of sustainability and the role of governance in achieving such. For example, a basic tenet of sustainable development is the ability of citizens to meet their basic needs (WCED 1987), which includes education. This requires having the economic means to do so. Therefore, although the analysis on economic dimensions showed that the general perceptions of respondents were negative to a large extent, the findings indicate that the impacts of such negative perceptions are sometimes mitigated by some dimensions of social sustainability. Take the scenario that Ghana prioritised access to education for the past decades and successive governments, irrespective of political ideologies, have sought to widen universal access to education (see, for example, Acheampong 2009; Arthur-Mensah and Alagaraja 2018), with the result that a broader group of citizens now enjoy the fruits of these social policies. Therefore, the introduction of education policies such as Free Compulsory Universal Basic Education (FCUBE) in 1995 (Acheampong 2009) and the Free Senior High School Policy in 2017 (Arthur-Mensah and Alagaraja 2018) certainly in intent, and almost by definition, extends the safety net to cover the urban poor in Ghana. This is reflected by the relatively positive responses in perception of education access in Kumasi and Obuasi.

The findings also have important policy implications when viewed from the perspective of gender difference. If gender differences exist in the perceptions and attitudes of citizens towards urban sustainability, then policy needs to address this with appropriate gender-specific provisions. The importance of gender is supported by evidence in the literature (see, for example, Awumbila 2006; Danquah and Ohemeng 2017). The findings in Kumasi suggest differences in responses based on gender regarding access to healthcare, level of sanitation provision, and on whether the development level was commensurate with urbanisation levels. Thus, for example, if challenges to sanitation provision hamper the sustainability experience and progress of women, then policy provisions aimed at improving sanitation services for women in cities, may have critical impacts on their sustainability experience and in turn urban sustainability.

However, the perception judgment of citizens could potentially be biased in diverse ways, as the factors underpinning respondents' perception remain complex. It is, therefore, likely that subjective perceptions without the assistance of monitoring data may not be an entirely accurate description of objective sustainability conditions. Nevertheless, local respondents are able to grasp the true core of local problems as they form their opinions based on their intuitive judgements, as underpinned by their experiential knowledge (Hsieh 2012). In sum, the findings have captured the perceptions of residents on selected sustainability statements based on their lived experiences and agree with the scholarly view that exploring the perceptions of citizens helps to deconstruct the interconnected facets of urban sustainability (Macke et al. 2018).

5.4.7 Section summary.

It is important to consider the perspectives of citizens when evaluating urban sustainability. The present section had the objective of exploring the perceptions of respondents in Kumasi and Obuasi on aspects of urbanisation and dimensions of sustainable development in the context of urban sustainability. The findings do not provide a clear way forward. However, in the context of urban sustainability policy formulation and planning, the findings highlight the divergence and convergence of preferences and attitudes among citizens; and therefore, they highlight the importance of an approach to urban sustainability that achieves an appropriate balance across the sustainability dimensions and incorporates the needs of vulnerable groups. The findings suggest that once the right conditions are in place, citizens' ownership of

sustainability ideas, policies, and projects could be encouraged. The 'further comments' made by the participants helped to inform the understanding of the dominant perception of respondents as they gave an indication that citizens are likely to prioritise socio-economic interests over environmental considerations. Overall, the findings contribute to the literature on urban sustainability in Africa from a citizens' perspective. To the best of the researcher's knowledge, this is the first study to empirically assess the sustainability and urbanisation perceptions of citizens in Ghana, more so in a comparative framework.

5.5 Integrated Discussion

The analyses in Sections 5.2–5.4 have demonstrated the spatial and temporal dynamics, as well as perceptions of citizens, on the interactions between urbanisation and sustainable development at the local urban level in Ghana. In order for development to be classified as sustainable, it must proceed in a way that ensures a balance among economic, social and environmental aspects. For example, from an economic perspective, the findings in Section 5.2 have provided evidence on how rapid urbanisation has influenced a demographic shift in Kumasi and Obuasi. However, consistent with the national urban employment situation (see Section 4.2), the demographic shift in both urban areas does not seem to have been accompanied by adequate economic opportunities for citizens as evidenced by citizens' perceptions of economic sustainability statements (Table 5.12) in Section 5.4. From a social perspective, the findings in Section 5.3 suggest that urbanisation in Kumasi and Obuasi has resulted in a higher concentration of urban social services and infrastructure. This has led to improvements in aspects of social development such as education, maternal health, and access to sanitation and water in Kumasi and Obuasi compared with average national performance. This observation was corroborated by the somewhat positive perceptions of citizens to the social sustainability statement concerning access to education in Section 5.4. It is, however, argued that adequate investment must be provided in order to ensure that rapid urbanisation does not undermine the capacity to provide urban services and infrastructure for citizens in Obuasi and Kumasi. From an environmental perspective, the findings in Section 5.2 suggest that urban land cover has expanded at the expense of natural vegetation in Kumasi and Obuasi, a situation that potentially undermines the integrity of urban environments in the two areas. Overall, the interactions between urbanisation and sustainable development in Kumasi and Obuasi have created urban forms which are possibly characterised by attributes such as less-compact and low-density development. Considering

the general urban poverty and unemployment situation in Ghana (see Section 4.2) and the perceptions of citizens on economic sustainability statements in Section 5.4, it could be argued that the role of market forces, uncontrolled landscape urbanisation, and the resulting urban forms could undermine sustainability by potentially creating impacts such as socio-spatial segregation. Consequently, socio-spatial segregation could threaten the livelihoods of the urban poor in Obuasi and Kumasi, as they will potentially become far removed from the concentration of economic opportunities in that exist in city centres (see Polidoro et al. 2012). In sum, the analyses in Sections 5.2–5.4 suggest that the interactions between urbanisation and sustainable development at the local urban level in Kumasi and Obuasi are currently not proceeding in a sustainable manner.

Chapter Six

6. National Urban Policy and sustainability in Ghana: a critical analysis

6.1 Introduction

Cities and their urban forms, in contemporary times, provide visual expressions of policies framed at the national level and implemented at the local level (Uitermark 2005). This means that as much as urban areas are shaped by the forces of urbanisation (including globalisation) (Zhang 2016), in no small extent, they tend to reflect the national urban planning and development philosophies. Alongside the popularisation of the sustainability agenda, the rapid pace of urbanisation has resulted in the increasing adoption of National Urban Policies (NUP) as a way of sustainably managing the urbanisation process (UN-Habitat 2016a). In this context, one could easily assume that the existence of such policies could help remedy the sustainability challenges of urbanisation and improve the resultant urban forms. However, despite the implications of urban policies for local sustainable development, there is limited understanding of how sustainability principles are incorporated (Davidson and Arman 2014). Accordingly, the salience of SD and urbanisation-related issues on both global and local scales makes it imperative to discern the extent to which urban sustainability principles are embedded in urban and development policies. In other words, if the gap between rhetoric and practise is to be bridged, then the sustainability focus of these policies should be examined.

The chapter provides an evaluation of the sustainability context of selected urban-related policy documents in Ghana and the remainder proceeds in four parts. The first part provides an overview of the selected policy documents and highlights the main objectives and foundations of the documents. The selected documents are the National Urban Policy (NUP 2012), which has been formulated by the Government of Ghana in order to steer Ghana's urbanisation to sustainable outcomes; and the Action Plan ([AP], MLGRD 2013), which is ancillary to the NUP and contains specific initiatives to be carried out in order to achieve the goal of the NUP. Due to their interdependence, they were analysed as one document. The second part presents findings on the evaluation matrix for the NUP and AP based on the sub-dimensions of UN-Habitat's (2016b) City Prosperity Index (CPI). The third part presents discussions on the sustainability constructs of the NUP and AP under the lens of the World Bank's (2018) analytical urban sustainability framework (USF). The fourth part presents

discussions on the factors that potentially affect the operationalisation of sustainability in the NUP and AP. Overall, it is important to note that the focus in this thesis is not to superficially criticise or praise the policy documents under consideration. However, an adage associated with issues of public policy and administration: 'seeing is believing', applies in this context. Therefore, an obvious caveat is the reality that these policy documents have only been launched in the last decade, and it will take time to implement and judge their effectiveness. Thus, the following sections will provide a review of selected urban-related policy documents and their overarching influence on urban sustainability in Ghana, rather than an assessment of policy outcomes.

6.2 Overview of National Urban Policy (NUP)

An overview of the National Urban Policy (NUP) is presented as follows. Ghana's urban vision, as articulated in the main goal of the NUP, is "*to promote a sustainable, spatially integrated and orderly development of urban settlements with adequate housing, infrastructure and services, efficient institutions, and a sound living and working environment for all people to support the rapid socio-economic development of Ghana"* (NUP 2012, p.21). The policy document outlines the following twelve objectives to be pursued in order to realise the goal of the NUP through the AP:

(a) to facilitate balanced re-distribution of urban population.
(b) to promote a spatially integrated hierarchy of urban centres.
(c) to promote urban economic development
(d) to improve environmental quality of urban life.
(e) to ensure effective planning and management of urban growth and sprawl, especially of the primate cities and other large urban centres.
(f) to ensure efficient urban infrastructure and service delivery.
(g) to improve access to adequate and affordable low-income housing.
(h) to promote urban safety and security
(i) to strengthen urban governance.
(j) to promote climate change adaptation and mitigation mechanisms.
(k) to strengthen applied research in urban and regional development.
(l) to expand sources of funding for urban development and strengthen urban financial management.

In general, the NUP sets out the Ghanaian government's response to the reality that half of Ghana's population lives in urban areas. The NUP is the outcome of a set of activities that began in March 2009 and included: situation analysis and framework for urban development and management in Ghana; stakeholder consultations; technical expert reviews; strategic environmental assessment; stakeholder (public) consultation workshops; and central government consideration and approval (Awortwi 2015). The NUP recognises the need to provide for the increasing urban population *vis a vis* the prevailing urban challenges in Ghana (see Section 4.2). Overall, the NUP specifically provides a framework and direction for remedying the challenges in Ghanaian urban areas by addressing urban development and management issues; urbanisation challenges; urban governance issues; urban security issues; urban economic development issues, with emphasis on the informal sector; urban infrastructure provision; urban environmental improvement issues; and urban planning issues (NUP 2012; MLGRD 2015).

6.3 Assessment of urban sustainability in development and urban policy

An evaluation matrix showing how the NUP and AP align with the dimensions of CPI is presented in Table 6.1. The number of ticks assigned is explained as follows. Zero ticks imply an absolute lack of coverage of the sub-dimension in the documents reviewed. One tick is assigned when a sub-dimension has been highlighted, but there is a lack of detailed discussion or associated implementation process. Two ticks are assigned when there is a detailed or associated implementation process captured in the document reviewed. For example, this means that for an indicator such as income: (i) zero ticks have been assigned if there is absolutely no mention or provision for income in the NUP; (ii) one tick has been assigned if income is explicitly mentioned in the NUP but not directly linked to a specific programme or objective in the AP; and (iii) two ticks have been assigned if income has been explicitly captured in the NUP, and has also been linked to a specific programme or objective in the AP. Therefore, from Table 6.1 (which assesses the content of the NUP and AP based on 18 selected sub-dimensions of the CPI), it is seen that a greater majority (13 out of 18) of the CPI sub-dimensions considered were assigned two ticks. This means that there was a policy initiative and / or associated key activity for the following: economic strength, employment, economic agglomeration, housing infrastructure, urban mobility, safety and security, land use, social inclusion, waste management, energy, municipal finance and accountability, participatory and institutional capacity, and governance of urbanisation. Four

sub-dimensions (economic equity, ICT, public spaces, gender inclusion) were mentioned but with no detailed policy initiative or key activity. Only one sub-dimension, air quality, received zero ticks as it is neither explicitly mentioned nor associated with a specified detailed action. Overall, the NUP and AP provide adequate scope for the sustainability of urban areas in the context of the CPI dimensions.

Table 6.1: Evaluation matrix for NUP and AP based on CPI sub-dimensions.

No	City Prosperity Index (CPI) Sub-dimension	Urban Sustainability Framework (USF) Dimension	NUP / AP score
1	Economic Strength	Urban economies	2
2	Employment	Urban economies	2
3	Economic Agglomeration	Urban economies	2
4	Housing Infrastructure	Urban economies	2
5	ICT	Urban economies	1
6	Urban Mobility	Urban economies	2
7	Public Space	Natural environment and resources	1
8	Safety and Security	Inclusivity and quality of life	2
9	Land Use	Natural environment and resources	2
10	Economic Equity	Urban economies	1
11	Social Inclusion	Inclusivity and quality of life	2
12	Gender Inclusion	Inclusivity and quality of life	1
13	Air Quality	Natural environment and resources	0
14	Waste Management	Natural environment and resources	2
15	Energy	Climate action and resilience	2
16	Municipal Finance and Accountability	Fiscal sustainability	2
17	Participatory and Institutional Capacity	Governance and integrated planning	2
18	Governance of Urbanisation	Governance and integrated planning	2

6.4 Evaluating the policy approach to sustainability

In the context of the documents under review, it can be argued that the NUP and AP are primarily concerned with the establishment of a long-term fundamental urban strategy for Ghana. Thus, Ghana's NUP represents a strategic policy response that recognises the opportunities and threats of rapid urbanisation and attempts to provide guidelines aimed at steering the path of development in cities to a sustainable one (UN-Habitat 2016a). In light of the findings in the previous section, a review of the sustainability context of the NUP is discussed based on the outcome and enabling dimensions of the Urban Sustainability Framework (as introduced in Chapter Three).

6.4.1 Urban economies.

The urban economy dimension is stipulated in diverse aspects in the NUP and they are all aimed at stimulating urban economic growth. A wide range of urban economic sub-dimensions are captured in the NUP covering the entire urban economic continuum, from high-end formal activities to low-end informal activities. For example, in highlighting the potential role of urban areas as engines of economic growth, the NUP makes a case for the designation of some urban areas as 'growth centres' for economic activities and infrastructural development by enhancing their investment portfolios and making provisions to mobilise resources for their investment and infrastructural needs. The NUP further recognises the impact of globalisation and seeks to make Ghanaian urban areas globally competitive. At the lower end of the urban economic continuum, the NUP widely captures the urban informal sector.

While it is impossible to elaborate on all the mechanisms that the NUP proposes to help steer urban economic development, a key theme that emerges is the role of the informal economy. From the information on informality and unemployment presented in Section 4.2.1.2, it can be argued that the intricacies between informality and unemployment in Ghana have an overarching effect on urban employment and overall urban economic development because the informal sector is estimated to constitute about 80% of Ghana's total labour force (Hormeku 1998; Osei-Boateng and Ampratwum 2011). Rather than merely making efforts to reduce informality, the NUP and AP recognise how critical the informal economy is to the overall urban economy, as four of the eight policy initiatives under urban economic

development are explicitly based on the informal economy. Specifically, these policy initiatives are intended to: (i) change official attitudes towards informal enterprises- from neglect to recognition and policy support; (ii) ensure that urban planning provides for the activities of the informal economy; (iii) build up and upgrade the operational capacities of the informal enterprises; and (iv) improve funding support for the informal economy. The attention given to the informal economy in the NUP gives cognisance to the idea that the rate of population growth due to urbanisation will render it difficult for urban areas in Ghana to create adequate productive employment opportunities for an increasingly urban population (Osei-Boateng and Ampratwum 2011). It can also be argued that the wide focus on informality in the NUP shows that informality is not ephemeral, but rather a mainstay in the urban economic space in Ghana (Hormeku 1998; Osei-Boateng and Ampratwum 2011), hence it becomes prudent that necessary policy actions (as evident in the NUP) are taken to support the informal sector in order to ensure that its positive contributions to the overall urban economy are maximised. The attention given to informality in NUP marks a shift away from elite policy-making (see Lipton 1977) and ensures that the interests of the most vulnerable are captured at the national level. However, when considered *vis a vis* the need to develop rural areas, such heavy focus on urban informality could be seen as a potential 'urban bias' as it potentially changes the narrative or conditions in favour of urban residents, and could give further impetus to rural-urban migration (Lipton 1977; Majumdar et al. 2004). Nevertheless, an obvious argument that can be advanced based on evidence presented so far in this thesis is that, the rapid nature of urbanisation *vis a vis* a fundamentally weak national economy, where poverty and unemployment are pervasive (Domfeh et al. 2012; Cooke et al. 2016), will more often than not, produce a large informal sector. Furthermore, if any national policy could be tailored to better deal with this urban challenge then it is the NUP. In general, the NUP captures elements of the urban economy and proposes policy initiatives aimed at promoting economic growth and making Ghanaian urban areas competitive across the continuum of urban economic activities.

6.4.2 Fiscal sustainability.

Meeting the infrastructural demands for urban areas is capital-intensive, a situation made worse in fundamentally weak economies (Farvacque-Vitkovic et al. 2008; Okeke 2014). In the traditional Ghanaian setting, development activities in urban areas are primarily funded by the central government. Rapid urbanisation will create demand for larger urban

investments in order to provide the necessary infrastructure and services for a growing urban population (Farvacque-Vitkovic et al. 2008; Okeke 2014). This, in effect, makes it unsustainable for the government to fund urban development solely (see, for example, OECD 2007; Lauermann 2017). Both policy documents recognise the issue of urban development finance and fiscal sustainability. For example, the NUP advocates for financially innovative ways of funding urban development and managing the economic sustainability of urban investments. This, it does, by promoting project financing approaches, such as public-private partnership (PPP) as an alternative option that will help alleviate the financial pressures on government (see, for example, OECD 2007; Lauermann 2017); and by promoting the implementation of fiscal decentralisation proposals through which the central government will devolve its fiscal tools to local metropolitan and municipal authorities, usually in terms of responsibility for revenue mobilisation and spending decisions. Such proposals will have benefits as well as challenges. For example, the fiscal decentralisation promoted by the NUP will allow revenue to be mobilised and spending decisions made based on locally-determined needs and priorities. Challenges could, however, arise where the devolution of fiscal tools threaten macro-economic stability; for example, where the local development priorities of a municipal authority (which are dynamic) do not align with the overall national development goals.

6.4.3 Inclusivity and quality of life.

From a housing perspective, the NUP gives explicit policy support for the provision of housing infrastructure for urban citizens. With a national housing stock deficit of at least 1.7 million units (Daily Graphic Online 2018), an increasingly urban population, together with the significantly low levels of social housing provision, mean that satisfying the housing needs of the urban population tends to rest on private provision. Accordingly, the NUP advocates for an enabling environment in order to propel private sector delivery of affordable housing in urban areas. At the same time, it makes a case for the upgrading of slums in urban areas and promotes private sector involvement in slum upgrade and redevelopment. An apparent threat to inclusivity here is the neo-liberal outlook of the policy. For slum upgrade, there is a possibility that the pursuit of often capital-intensive redevelopment projects could marginalise the urban poor who are usually the intended beneficiaries of such efforts and make them landless in the process (Obeng-Odoom 2013a). The discussion above corroborates the evidence by Davidson and Arman (2014) on how the dominance of neo-

liberal urbanism can impede the potential of urban policies to deliver transformational change in the context of sustainability.

A central theme in Ghana's main development vision is the reduction of poverty. Similarly, earlier sections of this thesis have demonstrated the pervasiveness of poverty in Ghana (see Section 4.2.1.3), especially in urban areas, and how it makes the urban-poor vulnerable, thereby undermining urban sustainability (Easterly 2007; Okyere et al. 2012). However, the analysis of the NUP shows an inadequate focus on poverty reduction. It is true that some of the objectives of the NUP, including for example, 'promoting urban economic development' may lead to poverty reduction. It is also true that some programmes, such as slum upgrade and policy initiatives on informality, may have the urban poor as intended beneficiaries. However, it is not clear in the NUP how these will lead to overall poverty reduction as there is no explicit link to any poverty reduction strategy in the document. Critically, there was no detailed breakdown or specification of actions to be carried out to mitigate or reduce urban poverty. The factors adduced above, therefore, reflect the need to formulate urban policy in a way that ensures sustainability through the incorporation of explicit inclusivity measures in policy design.

6.4.4 Natural environment and resources.

As has been shown already, urbanisation represents one of the most significant manifestations of population and landscape dynamics (Samal and Gedam 2015; World Bank 2015), both of which potentially exert varying degrees of pressure on the natural environment. This scenario has made it imperative to pursue urban sustainability actions in order to find ways of managing the delicate trade-offs between the anthropogenic impacts of urbanisation and the threats to the integrity of the natural environment. From an urban environment perspective, the NUP seeks to 'improve the environmental quality of urban life'. Four of the policy initiatives captured in the Action Plan focus on sanitation and waste management. Policy initiatives for creating environmental awareness through public education, as well as environmental management in mining towns are also captured. The remaining initiatives focus on the protection of environmentally sensitive sites such as wetlands or coastal areas. Curiously missing, perhaps, is a focus on air quality. Also, while 12 policy initiatives were outlined under the Action Plan to cater for the urban environment, there were no environmental targets set in the NUP and AP. For example, while four of the

policy initiatives focused on waste management, no target is captured; for example, to achieve 10% urban plastic waste recycling by a particular year. Without such targets, it is difficult to decipher how the policy initiatives will contribute to urban sustainability. In sum, the NUP and AP provide a broad guiding framework rather than the means and tools for achieving specific environmental targets. Nevertheless, they represent a strong starting point for mainstreaming environmental concerns into urban policy and decision-making.

6.4.5 Climate action and resilience.

The NUP tackles climate change with a policy objective as follows: 'to promote climate change adaptation and mitigation mechanisms'. Ghana's NUP and Action Plan show that its urban climate action emphases are on public education for climate and energy conservation, cleaner technologies, emission control, institutional governance and coastal or wetland management. As a country that is expected to reach an urbanisation rate of 70% by 2050 (Cobbinah et al. 2015a), one of Ghana's most significant challenges is managing the trade-off between urban growth and climate change processes (Okyere et al. 2012). It is important to note that mitigating climate change requires a multi-sectoral approach where sectors such as the power generating industry and manufacturing industry may have already implemented national plans towards GHG reduction and climate change mitigation. Nevertheless, the fact that cities contribute to 70% of global energy consumption and greenhouse gas emissions (Hoornweg et al. 2011) makes urban level climate change action strategic in managing the impacts of overall climate change.

Despite the climate actions highlighted in the NUP and the Action Plan, a question remains: are Ghanaian urban areas ready for climate change? A striking feature of the climate-related policy objective, as captured within the NUP and AP, is the lack of specific targets for climate change action (for example, emission reduction targets). For example, none of the policy initiatives under climate makes mention of greenhouse gas (the main proponent in the climate change conversation) or provides any targets for their reduction. Also, consistent with Wheeler (2008, p.488), whose research concluded that the majority of plans *"lack the strong actions and political and institutional commitment needed to mitigate emissions*"; rather than provide concrete evidence-based measures, the initiatives promoted in the NUP to manage climate change were somewhat vague. For example, one of the key activities to encourage the progressive reduction of hazardous substances by industry is to 'apply appropriate and

deterrent sanctions to defaulting firms / companies'. However, relevant pollutant or climate emission targets based on which the proposed punitive measures will be applied are hardly mentioned. This points to an apparent lack of urban pollutant or climate emissions data to inform urban policy at the national level. Accordingly, based on what is captured in the NUP and AP, and the apparent lack of data for urban-related climate action or decision-making, it cannot be confidently argued whether the NUP and AP's climate initiatives encompass the necessary elements that are needed for successful climate change adaptation in Ghana's cities in ways which could eventually contribute to urban sustainability. This is because while the NUP recognises the importance of climate change management in achieving overall sustainable development in cities, and the AP outlines the initiatives Ghanaian urban authorities should pursue to cope with their climate vulnerabilities, the lack of targets makes it difficult to determine how ambitious these initiatives are, and the national capacity thereof, to achieve them. Essentially, it remains to be seen what the capacity of local authorities for climate action in cities will be if national-level urban policy documents are limited in scope on progress and targets for climate change.

6.4.6 Governance and integrated planning.

The complexity of urbanisation and its sustainability dynamics demand comprehensive policy integration such that relevant policies are synthesised to achieve common goals (Pelletier 2010; Vojnovic 2014). Accordingly, governments tend to face criticism at all levels for the perceived inability of national programmes, policies, and funding to deliver multiple benefits, as they tend to fail at cutting across all departmental levels (see, for example, Niyonkuru 2016). Thus, from the perspective of this study, realising the sustainability imperatives of Ghana's NUP will require integrating national and urban development through the balancing of national and local interests. Ghana's NUP takes into cognisance the role of effective governance and planning in dealing with the challenge of population growth and development pressure due to rapid urbanisation. One of the key features of the NUP is the introduction of two cross-cutting initiatives which are intended to achieve multiple objectives namely: The Land Use and Spatial Planning (LUSP) Bill; and Development Guidelines. Passed as the LUSP ACT, 2016, it essentially provides revised legislative foundations based on which sustainable development of land and human settlements will be pursued. The Development Guidelines serve as instruments for the steering of spatial development and

comprise planning models, planning standards and land use zoning regulations. The planning models captured in the NUP are presented in Table 6.2.

Table 6.2: Planning models captured in Ghana's National Urban Policy.

Planning model	Coverage
National Spatial Development Framework	National.
Regional Spatial Development Framework	Administrative regions, sub-region, multi-region.
District Spatial Development Framework	District, multi-district.
Structure Plan	District, multi-district, sub-district.
Local Plan	Sub-districts (specific localities).

Source: NUP (2012).

How the sustainability construct in urban policy is framed and understood at the national level will eventually determine the extent of adherence or resistance at the local level (see, for example, Uitermark 2005). The aforementioned initiatives are, therefore, intended to cut across six out of the twelve objectives outlined in the NUP, giving coverage to issues including legislation, urban settlements, urban economy, integrated planning, local plans, land-use management, and planning standards.

6.5 Challenges to sustainability operationalisation in Ghana's NUP

From the discussion so far, one could argue that development in urban areas is underpinned by the policy regimes in force and manifest as such (see, for example, Portney and Berry 2010). In this context, then, any policy intervention in urban areas will have to take into consideration related sustainability factors. The review of the NUP and AP shows that they provide a strong stimulus for urban areas in Ghana to develop in a manner consistent with sustainability principles. In a provocative stance, it could be said that the issue of haphazard implementation of urban policy in SSA (Pillay 2008) raises the question as to the extent to which sustainability principles can be operationalised in urban policies. Answering such a question would require an understanding of the challenges in the implementation of the NUP, especially in the context of sustainability operationalisation. These are now discussed under

the following themes: distributional focus and integration of sustainability dimensions; sustainability rhetoric; policy coordination; and political barriers.

6.5.1 Distributional focus and integration of sustainability dimensions.

For all of its developmental intentions, the NUP shows some inherent tensions concerning its aspirations for economic, social, and environmental progress that might not be consistent with general sustainability principles (see, for example, Pelletier 2010; Vojnovic 2014). As has been shown in the literature (see Section 2.3.1) and reiterated throughout this thesis, in the context of the various dimensions of urban systems, the sustainability agenda requires holism (see, for example, Jeronen 2013). Thus, any policy initiative that can be attributed to one dimension would have implications for other dimensions (Pelletier 2010; Vojnovic 2014). For example, 'promoting urban economic development' cannot be disconnected from the fact that underlying factors such as 'market forces' which shape urban economies could have exclusionary tendencies that potentially threaten inclusivity for vulnerable groups, thereby undermining social sustainability (Young et al. 2006; OECD 2007). In a similar vein, the market forces could have an overarching influence on the objective of 'improving the environmental quality of urban life' by producing environmental costs due to market failure, or by producing environmental benefits through solutions to environmental problems. The urban sustainability challenge evident in this context is that, while the objectives and policy initiatives outlined in the NUP are critical to achieving progress in all dimensions of sustainable development in Ghana's urban areas, the policy fails to outline their inter-relationships such that there is a better integration of the balance of economic, social, and environmental dimensions in the context of sustainability (Pelletier 2010; Vojnovic 2014).

Of equal importance is the distributive focus of sustainability principles in the NUP. As inferred from the research that studied the sustainability constructs in urban policies in the literature reviewed in Chapter Two (for example, Lubell et al. 2009; Portney and Cutler 2009), the extent to which sustainability principles are incorporated in urban policies often depends on the respective local socio-economic and demographic contexts. Despite the recognition of the importance of embedding sustainability principles in urban policies, it does not extinguish the desire of countries such as Ghana (which is less-developed) to develop at all costs (Zhang et al. 2018). In fact, it is evident from perusing NUP and AP that there is fundamental prioritisation of economic development. This means that while the government

subscribes to various SD-focused international agreements such as the SDGs, it will not voluntarily relinquish its desire to move Ghana to a higher level of development. Hence, the political intentions of the Ghanaian government will determine whether an objective is pursued irrespective of whether or not it is consistent with sustainability principles. This aligns with the views of Davidson and Arman (2014) who have argued that the potential of urban policies to deliver transformative change in the sustainability context is limited by the prevailing political situation. Thus, overall, the NUP illustrates a stronger focus on economic outcomes as compared with social and environmental ones. Although the NUP does not discount the significance of achieving social and environmental progress, however, it can be inferred from its objectives that it values stronger economic progress as a springboard to support social and environmental development. From a sustainability perspective, this is consistent with the notion highlighted in Section 2.3.1 about how developed countries tend to stress the 'sustainable' aspect of the concept, while less-developed countries tend to stress the 'development' aspect (Zhang et al. 2018).

Furthermore, the wide-ranging objectives set out in the NUP could potentially derive benefits and costs that compete or conflict with each other. Consider the illustrative scenario of Ghana where unemployment is prevalent and inequality is deeply entrenched (see Section 4.2.1.2), the seemingly inexorable conflict of the NUP's economic objective that seeks to 'promote urban economic development', against the environmental objective of promoting 'climate change adaptation and mitigation mechanisms' which potentially includes reduction in greenhouse gas emissions, is set in play. However, as succinctly captured in the Action Plan: *"over time, all policy initiatives with related activities will need to be fully carried out, but in the situation of limited resources, it is crucial that priorities are clearly identified and actively pursued by all implementing bodies"* (MLGRD 2013, p.11). Thus, when it comes to setting priorities and making strategic choices, sustainability is potentially undermined as its competing costs and benefits may be difficult to reconcile. This demonstrates that the desirability of the sustainability agenda in public urban policy potentially loses traction when faced with competing macro-scale growth imperatives and it is ultimately shaped by the prevailing political economy (Davidson and Arman 2014).

It can be argued that despite the enthusiasm surrounding SD, the review of the NUP showed a limited incorporation into urban policy, as reflected by the overall sustainability outlook. This is consistent with the findings by Portney and Cutler (2010) who concluded, based on their

assessment of the sustainability policies of thirteen American cities, that few were on the path to sustainability. Critically, the NUP fails to articulate sustainability objectives and targets. A look at the objectives of Ghana's NUP shows that it advocates for some form of development. Nevertheless, these objectives are in no way operationalised into concrete sustainability goals. Perhaps while 'political will' may exist for incorporation, the fuzziness of sustainability makes it difficult to capture how its principles are met in the document. Nevertheless, within the purview of the discussion so far in this thesis, is the idea that the pervasiveness of the sustainable development agenda warrants an explicit incorporation of sustainability imperatives in urban policy discourse.

6.5.2 Sustainability rhetoric.

A fundamental challenge for a country such as Ghana, that has recognised the need to steer contemporary urbanisation to a sustainable future, and has rightly formulated a national urban policy, is to translate its objectives into reality (see Pillay 2008). In general, the NUP is moderately-ambitious, and its Action Plan provides an expansion on the initiatives designed to achieve the policy objectives. The plan sets specific policy actions and measures, but with only rudimentary development. That is, it cites specific measures for application to particular local points with varying degrees of definition, but without actually justifying them and developing them in depth. This means that translating the objectives of the NUP into practice on the ground, in terms of how it will achieve sustainability, is difficult. As has been noted throughout this thesis, the Ghanaian government has embraced SD, and although not explicitly mentioned, it is reflected in policy goals and government programmes (Alliance for Development 2014). Based on the notion that the extent to which sustainability principles are incorporated into urban policies typically depends on the respective local socio-economic and demographic contexts (Davidson and Arman 2014), the fuzziness of SD and Ghana's status as a poor less-developed country, mean that reconciling and operationalising sustainability principles through ambitious targets or objectives, as contained in the NUP, are imponderable and tend to be more of a rhetoric. Such a situation gives a clear indication of how the disjuncture between the policy's rhetoric and praxis potentially undermine the sustainability outcomes of the NUP and can be explained by the following. First, while the government has embraced SD, Ghana's urban areas and systems are heavily reliant on private and external input to thrive (see, for example, Springett 2013; Van Alstine and Barkemeyer 2014; Lauermann 2017). This means that its urban systems blatantly favour the interests of, and are

influenced by, market forces and external forces such as globalisation (see Sections 2.2.4 and 2.6.1.3). Such a situation, as was shown in Section 4.2.1.2, has for example, led to local firms folding up due to competition by foreign firms (Osei-Boateng and Ampratwum 2011) and reinforced wide-ranging inequalities in wealth and freedoms that hinder the development of urban areas (Young et al. 2006). Thus, despite the emergence of strong policy focus on SD, as captured in documents including the NUP, adherence to sustainability principles potentially remains rhetoric as strategies of contestation by the aforementioned forces will antagonise its operationalisation in order to protect their interests. This scenario is consistent with Pacione's (2007, p.248) assertion that *"the goal of sustainability is not an integral component of market capitalism and will inevitably encounter opposition from entrenched interests"*. The argument above is consistent with the views of other scholars (for example, Wheeler 2008) on how the absence of strong commitment to translating the sustainability features of urban policies into concrete actions renders their sustainability intentions into mere rhetoric.

6.5.3 Policy coordination.

The commitment of the Ghanaian Government to the SD agenda is captured in the plethora of programmes and policies aimed at promoting overall development (Alliance for Development 2014). Essentially, the formulation of the NUP recognised the importance of contemporary urbanisation in Ghana; including how it threatens human well-being or paradoxically serves as a platform for future prosperity, thereby reaffirming the country's commitment to SD (NUP 2012). The potential of urban policies to deliver sustainable outcomes is a function of the level of coordination among actors (McGuirk 2012). Accordingly, Peters (2018) has highlighted the advantages and challenges of coordination for the realisation of policy objectives. On the one hand, the author shows that the benefits of policy coordination include: dealing with cross-cutting problems; capturing changing demands; reducing duplication and contradictions among departments; and mitigating 'displacement' tendencies where an actor takes solo decisions without consultation that creates problems for another actor. On the other hand, the author highlights reasons for failure in policy coordination to include: power play in government that leads to inadequate information sharing; and where actors focus on their individual targets at the expense of collective goals. Yet, the NUP and AP do not document a holistic plan or, at the very least, a conceptual integrative map within which its objectives will be operationalised. Some of the

initiatives in the AP that are designed to achieve particular objectives are aligned to specific modal policies, but very little is shown in how they specifically integrate into the NUP. This makes it difficult to see precisely how the multiple objectives of the NUP will be achieved across all levels when, despite a clear goal, the steps to achieve its objectives remain rather nebulous. In essence, the initiatives outlined in the NUP appear to be standalone and the document, as viewed on its merit, does not illustrate the synergistic links between the various policy initiatives, neither does it translate into an integrated sustainability vision. This lack of convergence in sustainability thinking and action in the NUP potentially threatens cumulative sustainability impact. The above discussion provokes thought on whether the formulation of urban policies alone is enough evidence to show that cities are taking sustainability seriously (Portney 2003).

A review of the initiatives of the NUP reveals its reliance on existing policies and outlines a multiplicity of agencies through which it seeks to achieve its objectives. Thus, it can be argued that the NUP has been designed in such a way that the successes of its programmes are dependent on the successes of the other national policies and programmes that are already existing (McGuirk 2012). For example, the NUP makes reference to the National Housing Policy with regard to creating solutions to deal with urban housing problems. This means that any failure in that national policy will potentially affect urban housing. Thus, while the need to coordinate and integrate policies may depend on the context; complex issues such as sustainability and its bi-directional relationship with the urbanisation process which cut across different policy areas and actors, might warrant synergistically coordinating programmes and policies. Nevertheless, while the NUP and its ancillary AP outline how different agencies might contribute to the overall policy goal, they fail to show how these will be harmonised in an integrative manner such that benefits are maximised and conflicts reduced (see Peters 2018). Admittedly, any coordination might happen during the implementation phase, but taking into consideration the complexity of urban systems and the enormity of urban problems in Ghana (see Section 4.2), it is argued that any form of integrative coordination should be prospectively outlined at all stages from policy formulation through to implementation, and more importantly, captured in the main policy document. For example, the actors responsible for economic growth in urban areas may want to promote coal-powered industries while the actors responsible for the environment may want to introduce a strict climate change control regime. Therefore, it is important from the outset to outline in an integrative manner how actors, policies and programmes will be

coordinated if sustainability benefits are to be realised, as one actor could take decisions or implement programmes that may contradict or create problems for another actor. Again, concerning the coordination of different programmes, actors and policies, the NUP does not outline or set any national targets. Here, consistent with some of the reasons attributed to policy failure in the literature by Peters (2018), which include the potential of actors to sideline collective goals in order to meet individual targets, one might argue that setting national targets in the NUP will risk a scenario where no single agency takes responsibility for meeting the targets.

Again, consistent with the view of McGuirk (2012) on how the extent of coordination among actors determines how urban policies could translate into sustainable outcomes, it can be argued from this discussion that while the NUP promises a coordinated development of urban areas in Ghana, the scope of complementary policies and responsibilities of actor agencies seems complex. Effectively, there is some potential for the NUP to combine with other existing policies (for example, National Housing Policy) to reinforce each other, while at the same time the NUP's objectives may not be compatible with others. Although the aforementioned scenario may contribute to greater flexibility in the planning and governance of urban areas in Ghana, another consequence of such complexity may be the dispersion and thinning of resources such that their effect is reduced. As such, maximising the NUP's sustainability attributes would require improving coordination and cooperation both horizontally among national policies and vertically among the different government agencies in a way such that their cumulative effect creates a balance among environmental, social and economic goals.

6.5.4 Political barriers and the role of metropolitan and municipal authorities.

The Ghanaian government sets the context within which urban areas should develop through policies such as the NUP. However, it is within the remit of local governments (metropolitan and municipal assemblies) to design and implement specific local plans in order to achieve national objectives (Uitermark 2005). This provides an excellent case to illustrate the need to have a differential understanding of power when examining the implementation of national policies on the ground. Accordingly, a problematic aspect of the operationalisation of urban policies in Ghana is the top-down nature of formulation and implementation. Unlike in developed countries where municipal authorities exercise a higher degree of relative

autonomy in policy formulation and implementation, as well as possess considerable fund-raising powers, city authorities in Ghana tend to be mere political transmitters of central government policies with little powers of their own to significantly tailor such policies or raise requisite funds needed for transformational urban development.

What is apparent here is the importance of taking a more-balanced view of the power relationships between major actors in the policy formulation and implementation arena (Davidson and Arman 2014). As mentioned earlier, the Government, through the relevant ministries and agencies, sets the national policies and is responsible for providing the legislative and regulatory frameworks within which urban areas operate, as well as providing the requisite funding. The role of urban authorities, thus, becomes one of coordinators and implementers at the local level. The challenge of municipal authorities here is not of political support as the central government automatically holds control of local governments. Instead, the challenge is in the effective decentralisation of governing powers due to a lack of a constitutional guarantee of local autonomy. This impacts effective local decision-making and the managerial capacity of local urban governance regimes as the powers of local governments to determine how urban development is carried out is limited. The NUP shows that there are multiple actors assigned to achieve various objectives which could be seen as a positive sign as it shows the depth of institutional capacity, among others. Nevertheless, more often than not, such agencies are likely to compete with or supersede local governments as managers and protagonists of their various responsibilities (see Peters 2018). Such a scenario could indirectly affect the potential of achieving sustainability objectives at the local level as the local government's ability to integrate and coordinate all forms of urban activities is limited.

Another principal area where power relations remain complex is in the area of finance. Broadly speaking, the main source of finance for local governments in Ghana is through central government funding, and in the larger cities, internally generated funds from local taxation. In the bigger cities, private involvement is almost inevitable due to market-based forces (see, for example, OECD 2007; Lauermann 2017). This means that where central government funding is not adequate or forthcoming, market forces could potentially gain considerable influence on decision-making that affects urban sustainability (Wu 2001).

The political barriers to operationalising the sustainability aspects Ghana's NUP are also considered from the perspective of a change in government. As may well reflect the scenario in other less-developed countries, there is a tendency in Ghana, albeit well-within their political mandates, for different governments to change the policy implementation and / or course taken by past governments based on their ideologies or for the purposes of political expediency. A particular government might commit to prioritising economic growth policies, while another might focus more on social development policies or programmes. Also, a government may choose to prioritise long-term development plans while another may decide to stick with short- or medium-term development plans. For example, the National Democratic Congress (NDC) under whose government the NUP and AP were formulated in 2013 also launched a 40-year National Development Plan for Ghana (2018-2057) in the year 2015 aimed at fostering socio-economic prosperity, which would have had an overarching influence on the NUP's implementation and its sustainability operationalisation. However, upon the change of government in 2017, the New Patriotic Party (NPP) government, based on their vision and ideology, launched a 7-year Coordinated Programme of Economic and Social Policies (2018-2024), with a basic aim of job creation, prosperity, and equal opportunity for all. As a central policy, this is also expected to have an overarching influence on the NUP. Essentially, while the NPP government did not abandon or change the NUP itself, the medium-term development route taken will either help to deliver a better implementation of the NUP and its sustainability operationalisation or make it more complex and difficult to achieve; a situation which at this point can only be judged by posterity. What is clear here is that changes in political power potentially influence and change how the wider policy frameworks and development plans will support the NUP over time. This, again, is consistent with the views of Davidson and Arman (2014) who have argued that the prevailing political situation limits the potential of urban policies to deliver transformative change in the sustainability context.

Chapter Seven

7. Sustainable city development and the transition to urban sustainability in Ghana

7.1 Introduction

The sustainability implications of rapid contemporary urbanisation in Ghana, as demonstrated in the previous sections by the comparative sub-case-study on Obuasi and Kumasi, provides a valuable testing ground for assessing the usefulness and practicalities of different concepts of sustainable city development (as explored in Chapter Two). The key question here is how the initial categorisation of sustainable city concepts can be interpreted in the context of sustainable city development in Ghana, and by extension, Sub-Saharan Africa. One might assume that the plethora of sustainable city options highlighted in the literature (see, for example, de Jong et al. 2015), and also evident in physical projects across the globe (see, for example, Joss et al. 2011), may represent an avenue for ready-made solutions that can be tapped into in order to positively shift the sustainability trajectory of urban areas in SSA. For urban areas in SSA, modernism and traditionalism represent two different inherent values (Yuan 2009; Matunhu 2011). An intimate contact with Western urban concepts (as a remnant of colonialism) exists, where most urban plans and processes are still rooted in colonial interpretations of what should be (see Allcott et al. 2006; Boon 2009). Ideas of modernist and ambitious city development concepts proffered by advocates as key to a sustainable urban future (Noorloos and Kloosterboer 2018) also exist. However, the combination of the factors mentioned above and the fragile economic conditions in most SSA cities means that, in practice, there is a perpetual turbulent struggle to discover an identity for a 'sustainable' African city.

Following this introductory section, the remainder of this chapter proceeds in three sections. The first section assesses sustainable city development in Ghana through a case study that analyses the extent to which sustainability principles are embedded in Ghana's pioneer satellite city (Appolonia City). The second section provides an overview of the barriers to urban sustainability in Ghana based on the evidence available from this study. The third section discusses recommendations for urban sustainability transition and proposes a conceptual model of adaptive responses that could facilitate urban sustainability transition based on evidence available from this study.

7.2 Sustainable city development in Ghana: a case study of Appolonia City project

7.2.1 An overview.

Owned by Rendeavour (Africa's largest city developer), the Appolonia City project proposes to deliver a 2,325-acre master-planned city about 20 km away from Ghana's capital city, Accra (Table 7.1). It is widely recognised as the first satellite city in Ghana to be built from scratch. It is expected to accommodate 100,000 residents and host up to 20,000 visitors daily. The developer expects to spend an initial U.S.$. 250 million to provide the necessary urban infrastructure, out of which U.S.$. 100 million has already been spent. As a mixed-use development, the developers propose to construct a complete city that provides urban infrastructure and services, including residential, retail, commercial, educational, healthcare, and recreational facilities. They propose to provide up to 300 acres of public parks and gardens, a 200-acre light industrial area and a 120-acre central business district (CBD). Rendeavour has engages other corporate actors in delivering its satellite cities. In Appolonia City, there are partnerships with financial institutions such as Ghana Home Loans Limited (recently acquired by First National Bank) to provide mortgages, and also with other estate companies such as Bijou Homes.

Falt (2019) has provided a historical account of the Appolonia City project which is summarised as follows. The Appolonia City project was officially launched in 2012 by Ghana's President at that time, John Dramani Mahama. The initial construction started after Rendeavour acquired the land from the traditional authorities in 2012. This reflects the dominance of customary land tenure in Ghana, as was highlighted earlier on in this thesis. The land was vacant and parts of it had been previously used by a handful of farmers for small-scale farming. The acquisition of the land was preceded by a two-year reconnaissance and negotiation process. The structure plan and first local plan were approved by the Tema Metropolitan Assembly under whose jurisdiction Appolonia City fell in 2012. By 2017, the first fifty houses and housing foundations had been constructed. The expectation is that the full four-phase Applonia City project will be delivered by 20 years from the start of construction.

Despite being a privately-funded satellite city project, Appolonia City seems to have considerable political and State support. This situation aligns with the already highlighted dominance of neoliberal urban governance in Ghana which has resulted in increased reliance

on private sector provision for urban development. In the specific case of Appolonia City, published research (Falt 2019) shows that the project is widely embraced and supported by both central and local government institutions due to a strong preference for privatised urbanism in Ghana. Such a preference is borne out of the idea (perceived or factual) that the private sector is better positioned to deliver urban development projects and services compared to the central government which lacks the capacity to meet the urban development needs of a rising population (Falt 2019). Consequently, at the launch of the first phase of a 2,000-unit 'affordable housing' project in Appolonia City in 2017, the speech given by Ghana's President, Nana Akufo-Addo, reiterated political support for the project as he acknowledged that *"Appolonia City is a laudable initiative and I want to encourage others to emulate. I'm happy to note that the Appolonia Community is a shareholder in the project. The Government I lead is a national cheer leader of the private sector and we should do all we can to provide the enabling environment"* (Appolonia City 2019c, para. 4).

Furthermore, Appolonia City project enjoys wide political and State support due to the rationality that associates urban development with economic progress (Falt 2020). This is promoted by how the vision of Appolonia partially aligns with the policy objectives outlined in the NUP in the previous chapter (see Section 6.2). On the one hand, the developer of Appolonia City claims to seek to go beyond the challenges of stifling urban congestion and a dearth of quality housing by creating infrastructure– *"living and working spaces, communities, schools and hospitals- that will help sustain and accelerate Africa's economic growth, meet the aspirations of Africa's burgeoning middle classes, and serve as a catalyst for further urban development"* (Appolonia City 2019b, para. 2). On the other hand, enhancing socio-economic development by promoting sustainable, spatially integrated, and orderly urban development is the kernel of Ghana's NUP. This convergence of objectives underpins the significant political support given to the Appolonia City project.

Finally, the communities that surround Appolonia City are fundamental to its existence (Isakson 2019). This is because the construction of the city would not have been possible if the traditional authorities had not sold the land, which they held in trust for the community, to Rendeavour. Although verifiable details are scant, the local communities are believed to own 10% of Rendeavour's subsidiary in Ghana, which is known as Appolonia City Development Company (Falt 2019). As a result, a community trust fund has been set up into which the yearly dividends would be paid and utilised for developmental activities in the local

communities. Therefore, the local communities have been designated as official partners of the Appolonia City project and the traditional authorities reinforce this partnership by publicly supporting the project and performing ceremonial functions (Falt 2019). For some inhabitants of the local communities, the construction of the Appolonia City project presents an opportunity to participate in a new labour market (Isakson 2019). In this context, Isakson (2019) has reported that some local residents had already been employed as security guards, construction workers, etc. Although no large-scale evictions occurred (Falt 2019), the construction of Appolonia City may represent a loss of livelihood for the few small-scale farmers who were evicted to pave way for the project. However, the reality for all residents in the local communities is the imminent transformation of the previously rural landscape into an urban one dominated by Western-world architecture. Overall, the local communities seem to support the Appolonia City project as published research by Falt (2019) has reported that there is no evidence of bold resistance to the city's construction.

Table 7.1: Characteristics of the Appolonia City project.

Characteristic	**Comment**
City type	Satellite, mixed use development
Total size	2,325 acres
Ownership	Private
Initial investment	U.S.$.250 million
Population	Up to 100, 000 residents
Expected daily visitors	Up to 20,000
Housing units	25,000
Central Business District	120 acres
Light industrial park	200 acres
Public parks and gardens	300 acres
Planning	Master-planned

Source Appolonia City (2019a)

7.2.2 A sustainability evaluation of Appolonia City.

An evaluation matrix showing how Appolonia City ranks based on available data, and in comparison to the rankings designated to an eco-city (sustainable city) as defined by Jabareen (2006) is presented in Table 7.2. The evaluation is explained as follows. Numerical values of

3, 2, and 1 were assigned for 'high', 'moderate' and 'low' rankings respectively. Therefore, based on Jabareen's (2006) definition, an eco-city would be characterised by the following: (i) moderate mixed land use; (ii) moderate diversity in the representation of different income groups, household size, etc.; (iii) high level use of sustainable transport means of transport such as cycling; (iv) high level use of sustainable energy forms such as passive solar energy; (v) less compact urban forms; (vi) high amount of green spaces; and (vi) moderate density of development. The definitions and assumed benefits of the factors contributing to a sustainable urban form have been presented in Table 2.1.

From Table 7.2, Appolonia scored 13 out of a possible total of 21, compared to the eco-city defined by Jabareen (2006) which scored 16 out of 21. Specifically, Appolonia City was ranked lower than Jabareen's eco-city in three categories (diversity, sustainable transport, and sustainable energy) out of the seven categories considered; the two cities were ranked equally in three categories (compactness, greening, and density), and Appolonia City was ranked higher than Jabareen's eco-city in one category (mixed land use). The general inference from the matrix presented, therefore, is that, to a considerable degree, Appolonia City does not conform to the visions of a sustainable city based on Jabareen's (2006) sustainable urban form matrix. What follows is a narrative that attempts to justify the evaluation of the extent to which the Appolonia City project meets the visions of a sustainable city.

Table 7.2: Evaluation matrix for Appolonia City based on Jabareen's (2006) sustainable urban form matrix.

Factor	**Jabareen's evaluation**	**Appolonia City (author's evaluation)**
Mixed land use	Moderate (2)	High (3)
Diversity	Moderate (2)	Low (1)
Sustainable transport	High (3)	Low (1)
Sustainable energy	High (3)	Moderate (2)
Compactness	Low (1)	Low (1)
Greening	High (3)	High (3)
Density	Moderate (2)	Moderate (2)
Total Score	**16**	**13**

Source: Author as adapted from Jabareen (2006).

(a) Mixed land use.

Appolonia City was ranked high (3) in the mixed land use category as its master plan shows that the development is a strategically planned mixed land-use zone (see Figure 7.1 below). With approximately 2,325 acres of land area, its master plan proposes a land use mix that includes a 120-acre CBD to host commercial activities; a 200-acre light industrial area, over 300 acres of public parks, and residential housing areas. This means that Appolonia City could potentially maximise the sustainability benefits of agglomeration of mixed land use, which includes shorter commute distances for people who will live and work inside or near the city (see Table 2.1).

Figure 7.1: Map of Appolonia city showing land-use mix.
Source: Appolonia City (2019f).

(b) Diversity.

Appolonia City was ranked low (1) in the diversity category due to an apparent lack of inclusivity. Despite the political support that the project enjoys, Appolonia City is an inherently commercial project whose top-most priority will be to generate profit in order to secure the interests of its investors. Consequently, the characteristics of the project shows that it has not been designed to suit the needs of low-income groups. This is succinctly captured in the vision of its developer which has already been expressed in Section 7.2.1. While the mixed-use design and the presence of commercial and industrial areas could attract prospective employees from low-income backgrounds who will diversify the social mix in the city, access to residential facilities, the most significant aspect of the city project, is likely to exclude people from low-income backgrounds. For example, the cost of a plot of land measuring '40ft x 70ft' in the Nova Ridge Estate in the city starts from GH₵ 112,750 (equivalent to U.S.$ 20,000 [Appolonia City 2019d, para. 4]); while a 1-3-bedroom Oxford-type house starts from GH₵ 478,750 (equivalent to U.S.$ 80,000 (Appolonia City 2019g, para. 1). Taking cognisance of the level of poverty in Ghana (see Section 4.2.1.3), it is potentially unlikely that any part of Appolonia City is within the financial means of the average Ghanaian.

Consequently, the Appolonia City project has the potential to be an elite enclave and a practical manifestation of neo-liberal mainstreaming in urban development (see Section 2.2.4), as evidence of its initial phase suggests the construction of a modern but expensive city. In order to get the quantity of land needed to establish this city, the developer had to acquire land from land owners in communities which are typically rural. Researchers from the University of Bergen (Norway) have captured the contrast in the development between Appolonia City and the surrounding communities as shown in Figure 7.2 and Figure 7.3. On the one hand, Figure 7.2 shows that the houses in Appolonia City are well-planned and have been constructed with expensive materials. On the other hand, Figure 7.3 shows an unstructured cityscape with houses mainly constructed from inexpensive materials in the nearby village. Accordingly, the developer attempted to improve conditions in the nearby communities through its corporate social responsibility projects. For example, it has renovated the basic school building in the Appolonia village community in order to provide a conducive environment for learning and to enhance education in the community. This can be seen in Figure 7.4 which shows the state of the basic school in Appolonia village before and after renovation. While this is laudable, it appears tokenistic and has probably been done in

order to maintain the developer's social licence to operate. From the foregoing discussion, it is evident that inclusivity in urban development is low in the Appolonia City project.

Figure 7.2: Image showing 'The Oxford' types of houses under construction in Appolonia City.
Source: University of Bergen (2019).

Figure 7.3: Image showing the housing conditions in a nearby Appolonia village.
Source: University of Bergen (2019).

Figure 7.4: Image showing basic school in Appolonia village before and after renovation.
Source: Appolonia City (2019e).

(c) Sustainable transport.

Appolonia City was ranked low (1) in the sustainable transport category due to a lack of an explicit mention of sustainable transport systems in any of its publicly available information. Appolonia City proposes to provide permanent paved roads (see Figure 7.5); dedicated pedestrian walkways, and jogging and biking trails. Nevertheless, for a satellite city that is expected to accommodate approximately 100,000 residents (in addition to about 20,000 daily visitors), a lack of a dedicated public transport system is of considerable significance. Recalling the general urban transport challenges in Ghana discussed in Section 4.2.1.5; including the increasing rate of vehicle ownership (Obeng-Odoom 2009a), it can be speculated that private vehicle use is expected to be the main source of transport in Appolonia City. This lack of alternative sustainable transport has potential consequences, including air pollution and further stress on the already-poor public road infrastructure. Surrounding communities are likely to be affected as the impacts of activities in urban areas transcend physico-administrative boundaries (see, for example, Simon 2010). It may be fair to argue that since the project is proceeding in phases there is a likelihood that a sustainable mobility option such as Bus Rapid Transit (BRT) may be provided later, and the capital requirements of an initiative like BRT mean that its financial viability might only be feasible in the later stages of the city's development. Nevertheless, the relevance of sustainable

mobility to sustainable city building cannot be understated, thereby warranting its explicit capture in project-related plans, statements, visions, and websites.

Figure 7.5: Image showing transport infrastructure in Appolonia City.
Source: Appolonia City (2019).

(d) Sustainable energy.

Appolonia City was ranked moderate (2) in the sustainable energy category. This is because it proposes to provide a constant supply of electricity (a rarity in Ghana) to the prospective residents and businesses through dedicated bulk supply points and transformers. Furthermore, as shown in Figure 7.6, Appolonia City promotes sustainable energy use as some of its houses are fitted with solar panels. This ensures that the city, to a considerable extent, maximises the use of passive solar energy which is available in abundance due to the tropical climate in Ghana. The potential storage and use of solar energy has added sustainability benefits such as improving the local micro-climate in Appolonia City (see Table 2.1). However, the potential dominance of private vehicular use as the main source of transport in the city is likely to erode the possible sustainable energy gains due to increased vehicular emissions.

Figure 7.6: Image showing an Appolonia house fitted with solar panels.
Source: Appolonia City (2019a)

(e) Compactness.

Appolonia City was ranked low (1) in the compactness category. While the mixed land use design adopted by Appolonia City could lead to a compact and more sustainable urban form, the cityscape is dominated by residential housing and, as shown in Figure 7.5, the majority are semi-detached, detached or terraced. These types of houses are typically designed for single families. This means that more geographical space is being used for house construction than would have been used if multi-storey buildings were to be constructed.

(f) Greening.

Appolonia City was ranked high (3) in the green category as up to 300 acres (over 10% of the total area of 2325 acres) has been designated for use as public parks and gardens. In addition, the residential housing constructed so far in Appolonia City (see, for example, Figure 7.2 and Figure 7.5) show the presence of manicured lawns. The significant greening component in Appolonia City could accrue a myriad of sustainability-related benefits (see Table 2.1). First, it will ensure that biodiversity in the city is protected, as well as create opportunities for people to interact with biodiversity. Second, the parks could enhance social cohesion within the city as they would serve as recreational avenues for residents to meet and mix. Third, potential woodlands in Appolonia City could help mitigate climate change by serving as carbon sinks in order to absorb the expected GHG emissions concentration due to the

potential dominance of private vehicle use discussed earlier. Overall, the urban parks and gardens will also make the city aesthetically pleasing which could accrue health benefits for people who patronise Appolonia City (see Table 2.1).

(g) Density.

Appolonia City was ranked as moderate (2) in the density category. While the expected population of about 100,000 people and the concentration of economic activities are typical of high-density areas, the city's plan (Figure 7.1) and the residential housing constructed so far (Figure 7.2; Figure 7.5) suggest otherwise. Essentially, the sustainability benefits of population concentration in Appolonia city is potentially eroded by increased GHG emissions as low-density residential housing influences private vehicle use.

7.2.3 Appolonia City: A sustainable city?

Reconciling the normative visions of a sustainable city expressed earlier in this thesis (see Section 2.3.3) and the characteristics of the Appolonia City project, the evidence and discussions so far do not suggest a total convergence of characteristics. While this study recognises the on-going construction of the Appolonia City project, the evidence and discussions have provided a snapshot of the mainstream conceptions of sustainable city development in Ghana. Accordingly, as evidenced by Appolonia City, it can be implicitly assumed that the practical implementation of concepts of a 'sustainable city' in Ghana leads to the potential construction of an urban space which is innovative and more compact; allows mixed land use; and is aesthetically pleasing. However, rather than promote inclusive urban development that enhances the achievement of greater and wider sustainability, the characteristics of the project portray a potential creation of an elite enclave that is beyond the reach of the ordinary Ghanaian and is potentially dominated by unsustainable practices such as private car dependency. Furthermore, when the images of Appolonia City are juxtaposed with those of the surrounding Appolonia villages, they demonstrate the dominance of Western ideas and a lack of cultural sensitivity to urban development in the Ghanaian context. While not in the same dimension, the findings are consistent with those expressed in the literature (see for example, Caprotti et al. 2015) where new city developments are potentially beneficial to its inhabitants but limited in its contribution to wider sustainability. Overall, from the perspective of this study, the general inference that can be made, based on evidence available on Appolonia City, is that there is a significant gap between the

conceptions of sustainable city development expressed in Chapter Two and its implementation in the Ghanaian context.

7.3 Barriers to sustainable city development in Ghana

From the review of the Appolonia City project in the previous section, it can be argued that the mere existence of sustainable city concepts which have been designed based on sustainability principles does not guarantee the creation of sustainable urban areas on implementation. Intrinsic barriers and external influences which may include, but are not limited to, geopolitics, land tenure, governance, economic, and environmental factors, tend to make it more challenging to address the urban sustainability problems of cities in less-developed countries, and specifically in this context, SSA. The discussions in the following paragraphs focus on how politics and finance critically moderate the interplay between urbanisation / city development and the broader sustainability agenda. While a myriad of barriers exists, from the perspective of this thesis, the politically-charged nature of urbanisation (Pieterse 2008; McGranahan et al. 2009; Jones and Corbridge 2010; Parnell and Simon 2010) and the pervasiveness of poverty in Ghana (see Section 4.2.1.3) make the factors of politics and finance significant in explaining why sustainable city concepts have been slow to gain a foothold in SSA.

(a) Politics.

Political power is inextricably linked to and influences any social process, and the successful implementation of sustainability-related initiatives is shaped, in no small extent, by the prevailing political economy (Davidson and Arman 2014). For Ghana, implementing any concept for urban sustainability, just as any other development process, is fundamentally a political exercise. Like most of SSA, where economies are dependent on natural resource extraction, there is a potential risk that Ghana's path to growth will fail to build connections between urbanisation and sustainable development as it is believed that resource-based growth is not naturally urban-oriented (UNECA 2012a; Turok and McGranahan 2013). This potentially puts governments under pressure to create alternative economic opportunities that support the livelihoods of citizens. Also, governments are keen to associate and endorse projects related to the concept of sustainable development for political expediency. Consequently, governments tend to be receptive to the idea of sustainable city projects as a way of diversifying their economies and transitioning from natural resource dependence. This

means that governments encourage private investors to develop projects such as Appolonia City as normative or prescriptive options for city building where economic growth, be it GDP increment or investment profits, leads to the achievement of public goals including urban regeneration (OECD 2007; Wang and Tomaney 2019). This makes it safe to assume that major city projects that are being promoted for their alignment with the principles of sustainability (see Section 2.3.3) are mainly pursued for their economic competitiveness. However, as legitimate as the goal of creating economic growth is, how it ensures the economic, social, and environmental well-being of the wider urban system and society is not always clear. In effect, governments could be focussed on how GDP is increased through such projects while the private-sector also focuses on their profits. Thus, given the geopolitical and physico-administrative realities of urban systems in SSA (Simon 2010), there is a risk of corporatisation and neo-liberalisation of urban systems. Subsequently, if priorities are not well-managed in the planning and distribution of potential benefits during the implementation of the sustainable city concept, sustainability outcomes could be undermined (Wu 2001; Young et al. 2006; OECD 2007). For example, as noted earlier, scholars, including Mishra (1999), have suggested that the neo-liberal realignment in urban areas promoted by globalisation has never guaranteed social integration, cohesion or the survival of the social groups which its market mechanisms tend to marginalise. The implications could be harsher in SSA as most of these concepts have been developed based on realities in the global North, where the pre-conditions for sustainable city are well entrenched in planning processes compared to SSA. Crucially, political dispensation could impede the achievement of sustainable outcomes in the implementation of sustainable city concepts as citizens' interests (especially of vulnerable groups) are projected as subservient to corporate and government interests (Wu 2001; OECD 2007; Lauermann 2017). This could be linked to the themes of urban entrepreneurialism, urban exclusion, and citizen participation, discussed earlier in Chapter Two.

(b) Finance.

In general, SSA cities lack the financial capacity to cope with urbanisation (Smit and Parnell 2012). Accordingly, the substantial capital requirements for establishing new cities like Appolonia City, or retrofitting existing ones in a way consistent with the principles of sustainability, mean that they are mostly financed by private investors or through public-private ventures (OECD 2007; Lauermann 2017). Furthermore, the Appolonia City sub-case-study has shown how the capital-intensive nature of implementing sustainable city concepts

means that more often than not, they become elite enclaves for people who can afford to live there (See, for example, Mishra 1999; Anthopolous 2010; Obeng-Odoom 2013a). Critically, the argument above shows that greater and well-targeted investment will be needed from governments and the private sector if the uptake of new city concepts is to shape the creation of fair and sustainable urban societies.

7.4 Towards a transition to urban sustainability in Ghanaian urban areas

The evidence and discussions put forward in this thesis (i.e. review of urban challenges in Ghana in Chapter Four; the general sustainable development situation in Ghana in Chapter Four; landscape and demographic urbanisation in Chapter Five; the subjective experience of urban citizens in Chapter Five; the sustainability appraisal of the Appolonia City project in this chapter) suggest that urban areas in Ghana, as currently constructed, are on a trajectory of unsustainability. These trends, if allowed to persist in an era of rapid urbanisation, will expand the catalogue of unsustainable urban practices and reinforce the unsustainability of Ghana's urban areas. The critical challenge for urban sustainability in Ghana, therefore, is to steer urban areas onto a trajectory of sustainability through an adaptive and systemic transformation of their urban systems in response to rapid urbanisation. Building on the findings and discussions from the previous chapters, this section introduces discussions on potential responses and strategies through which the transition to urban sustainability could be facilitated in the Ghanaian case. It is important to note, however, that the responses for a transition to urban sustainability recommended from this study are not exhaustive or mutually exclusive. Rather, within the scope of this study, they are intended to capture the distinct ways in which a transition from the status quo to sustainable pathways could proceed based on the findings and discussions produced. The remainder of this section proceeds in two parts. The first part presents recommendations as potential strategies that could facilitate the transition to sustainability in Ghana's urban areas. Using the DPSIR framework, the second part suggests an adaptive conceptual model to facilitate urban sustainability transition decision-making in the Ghanaian context, based exclusively on the scope and findings of this study.

7.4.1 Towards a transition to a trajectory of sustainability in Ghana's urban areas.

The sustainability solutions embedded in the various approaches to urban sustainability identified in Chapter Two recognise the nexus between urban sustainability and future global

sustainability. It will, therefore, be a logical corollary to assume that proponents of the respective approaches would have the belief that any particular approach offers the requisite tools and principles to support broader sustainability discourse and implementation. Nevertheless, it is evident from the findings on the comparative sub-case-study explored in Chapter Five that no single approach could adequately address fundamental sustainability processes *vis a vis* the multiple challenges to urban systems in Ghana described in Section 4.2.

While not discounting the sustainability solutions proffered by the different schools of thoughts on how best to induce a transition to a trajectory of urban sustainability through sustainable city development (see Section 2.3.3), the dynamics of urban systems in SSA, coupled with rapid rates of urbanisation, generally demand an eclectic strategic approach in order to address the complex needs of urban areas in SSA in a manner consistent with sustainability principles or the ideals of a sustainable city. From the perspective of this study, and consistent with the views of other scholars (see, for example, Campbell 2012), an eclectic approach, which in this context can be described as a consolidation and strategic application of a range of principles and policy prescriptions from different sustainable city concepts and transition strategies will help shape the urban sustainability trajectory in Ghanaian cities by providing opportunities to critically analyse what is being done (prescriptive actions), *vis a vis* what ought to be done (normative actions), rather than build cities based on particular concepts. The practical implication is that relevant decision-makers would have to carefully select the best available solutions from the various approaches to sustainable city development and tailor them to the challenges that need to be solved at the local urban level. This means that while the transition to future urban sustainability might be potentially too complex to manage due to rapid contemporary and future urbanisation, adopting an eclectic approach for urban transition offers an opportunity to identify and synthesise the value-added that consolidation of the sustainable city concept ideas might provide to urban sustainability processes. The following paragraphs will, thus, discuss recommendations that will potentially facilitate a transition to a trajectory of sustainability in Ghanaian urban areas. The recommendations are presented in ways that allow for the consideration of multiple pathways for facilitating a transition to a trajectory of sustainability, rather than considering a single most-likely pathway. Essentially, this discussion is not intended to be exhaustive, rather it is demonstrating the wide-ranging ways in which the transition to a trajectory of sustainability may be realised based on the findings of this study.

7.4.1.1 Policy and organisational context.

Transitioning to urban sustainability requires changes to the institutional foundations which shape dominant and prevailing practices. Accordingly, sustainable urban transformation, which is the basis for any transition to urban sustainability, relies to a large extent on urban governance. This is so because the prevailing governance mechanisms embody the structural rules that determine functioning of urban systems and the trajectory of sustainability. The findings in Chapters Four and Five have highlighted the rapid pace of urbanisation in Ghana and the intractable challenges it poses to sustainable development at the local urban level. While the prevailing conditions in Ghana's urban areas mean that urban design and planning provisions have been potentially outpaced, their transition to sustainability can be guided. This requires a fundamental overhaul of policies and governance practices that guide urbanisation and sustainable development. On a general level, the government must pursue an agenda for policy and institutional reform in the context of sustainability. This means that, if the government is truly committed to SD, it must fully align its policies, institutions and practices to the principles of SD.

(a) Urban policy.

Ghana's National Urban Policy was formulated and implemented in 2013 in order to facilitate the transition of its urban areas into sustainability (see Chapter Six). Centrally-embedded within the NUP is the sustainability concept as demonstrated in its urban development strategies contained in the Action Plan. Nevertheless, the analysis of the sustainability focus of the NUP showed that it is skewed towards economic dimensions at the expense of social and environmental dimensions. A general inference from the findings on Ghana's urban policy in Chapter Six is that the government's policy-making ideology is fundamentally shaped by an affinity to establish sustained economic growth. The transition to a trajectory of urban sustainability would, however, require an ideological shift in policy-making from the dominant focus on economic development to a more balanced focus among the environmental, social and economic dimensions of sustainability.

With over half of Ghanaians living in urban areas, the findings on the assessment of sustainable development and the citizens survey in Chapter Five demonstrate the importance of meeting the basic needs of people for achieving greater sustainability in urban areas. This requires formulating and implementing policy measures that will improve the well-being and quality of life of urban citizens in Ghana. Taking cognisance of the poverty situation in

Ghana (see Section 4.2.1.3), which is exacerbated by neo-liberal dominance in Ghana's urban systems, a transition to a trajectory of sustainability specifically requires formulating policies to address the socio-economic needs of urban citizens with an explicit focus on vulnerable groups and social justice. Furthermore, the perceptions and contributions of citizens towards enhancing urban sustainability in places they live tend to depend on the extent to which they can meet their current needs. The findings in Chapter Five have captured how citizens expressed their lived experiences in the context of sustainability (based on their perspectives of selected urban sustainability statements). In the Ghanaian case, evidence from Obuasi and Kumasi suggests that such perceptions are dominated by economic concerns. This creates a need to incorporate the preferences and opinions of the local population in sustainability policy-making and planning in order to achieve greater sustainability in Ghana's urban areas.

In order to steer Ghana's urban areas onto paths of sustainability, much more fundamental research needs to be undertaken. As was evident in the analysis of Ghana's NUP, the absence of relevant emissions targets shows that there is an apparent lack of data on urban systems, including climate, which can be used to inform policy. This makes it relevant for the authorities to conduct research that helps to develop Ghana-specific indicators and establishes criteria, based on which progress to sustainability could be evaluated for policy-making purposes. While evidence from the literature reviewed in Chapter Two highlights the various indicator sets that could be used to measure urban sustainability, this thesis has already stressed how there is no universally accepted set of indicators, as well as the difficulty in acquiring data on indicators. Furthermore, as evidenced by the Appolonia City project presented earlier, the societal and political conceptions of a sustainable urban area tend to contradict inclusive sustainable development. Therefore, carefully targeted research to produce a dynamic model of the quintessential Ghanaian urban area as a sustainable city would serve as a reference for policy-making based on which the sustainability transition trajectories of Ghanaian urban areas could be evaluated and facilitated.

From a policy coordination perspective, the urban policy analysis in NUP showed that the formulation and development of sustainability-related policies and plans can be challenging due to the fuzziness of sustainability as a concept (see, for example Jabareen 2008); a situation made complex by the need to ensure that such policies complement and are compatible with existing policies and plans. Therefore, stimulating a transition to a trajectory

of urban sustainability would require an enhanced coordination of sustainability-related policies and plans in order to ensure that their synergistic effects are maximised.

Last but not least, the political nature of sustainability as a concept means that the components of Ghana's NUP have potentially been selected based on what is politically feasible, which, in turn, is potentially imposed externally. For example, as the uptake of national urban policies has been recommended by an international organisation like the United Nations (UN-Habitat 2016a), there is the potential that components of the NUP that are considered deliverable have been framed by the perspectives of such international organisations. As demonstrated in Chapter Six, a resulting implication is the tendency of urban policies to be considered as rhetoric. Thus, from an urban policy perspective, a transition to urban sustainability will be successful if realistic and politically deliverable targets are chosen as policy solutions.

(b) Institutional.

Generally, the transition to a trajectory of urban sustainability will demand an adjustment of organisational infrastructure across all relevant institutions. From an organisational perspective, the narratives from the analysis of Ghana's NUP in Chapter Six highlight the need for greater decentralisation in order to enhance local government engagement in the context of sustainability. An ethos of centralisation in Ghana means that while municipal and metropolitan government authorities are the implementers of the NUP, it is not clear how they can effectively contribute to achieving the NUP's objectives independently in the absence of a strong local mandate. Crucially, in order for Ghana's urban areas to transition to a trajectory of sustainability, there is the need to create a synergy between the implicitly top-down nature of policy formulation and effective local government through greater decentralisation. Decentralisation, in this case, is expected to promote urban sustainability by reinforcing and empowering local level decision-making. In essence, the transition to a trajectory of urban sustainability will be shaped by the extent to which a shift in the hegemonic power structures governing urban areas in Ghana is achieved.

The expansion of urban land cover at the expense of natural vegetation (Chapter Five) and the ecological deficit caused by the ecological footprint of Ghana's population exceeding bio-capacity (Chapter Four) demonstrate the unsustainable manner in which development is proceeding from a resource consumption perspective. Mitigating these trends of natural

resource consumption and facilitating a transition to greater sustainability will, thus, require a shift from reactionary governance to precautionary governance. This includes the need to reform the country's tax systems in order to introduce instruments such as ecological tax. Furthermore, the analysis of urban policy in Chapter Six showed how the lack of mechanisms for assessing environmental impacts potentially undermine sustainability efforts. This demonstrates a need to enhance the capacity of relevant institutions to internalise the environmental cost of urbanisation and related socio-economic development. This requires concerted efforts for data collection and the development of relevant accountability mechanisms for effective environmental impact assessment.

The transition to a trajectory of sustainability in Ghanaian urban areas will benefit from deepened coordination between the central government and other relevant organisational stakeholders. From a resource-based city perspective, the Obuasi case study has demonstrated how Obuasi's local economy is fundamentally dependent on the activities of AngloGold Ashanti and how their activities have shaped the quality of the urbanisation process, including the provision of jobs and services for the increasing population in Obuasi. The strong emphasis placed by respondents on economic sustainability in the survey demonstrates the inter-linkages between the economic prosperity of citizens and the growth of businesses such as AngloGold Ashanti. Consequently, the capacity of organisational stakeholders, including AngloGold Ashanti, to shape the transition to sustainability from an economic perspective will be enhanced through stable macro-economic policies that potentially safeguard the growth of businesses, as well as through incentives like tax breaks. Furthermore, the deleterious environmental effects of the mining operations of AngloGold Ashanti have been widely acknowledged in the literature and from the responses of participants in the citizens survey (see, for example, ActionAid Report 2006; Foli et al. 2012). As such, environmental sustainability in a place such as Obuasi could be enhanced through coordinated partnership for environmental stewardship between AngloGold Ashanti and the relevant government authority. A coordinated partnership, in this case, would be expected to provide the financial and logistical resources, as well as an effective monitoring and compliance regime that may be necessary to achieve greater environmental stewardship and sustainability.

From a planning perspective, rapid urbanisation and the dominance of market forces pose potential challenges to the transition to sustainability due to challenges including weak

planning regimes and capacity (see, for example, Bryceson et al. 2009; Turok and Parnell 2009; Bekker and Therborn 2012; Fox 2014). The time series analysis of land cover change and the growth of urban population captured in Chapter Five demonstrate the spatial and temporal ways in which sustainability as a concept challenges urban planning practice in Ghana. As the (un)sustainability of Ghanaian urban areas is primarily a matter of cumulative impacts, the adequacy of the prevailing planning regime is critical as it is the arena where strategies to achieve greater sustainability over the long term will be conceived, mobilised, accepted or rejected. The extent of urban expansion at the expense of natural vegetation cover in the two case study areas in Chapter Five demonstrates how market forces and the land tenure system (see Sections 2.2.4 and 4.4.1) have weakened the capacity of relevant authorities to take regulative measures to limit the spatial consumption of land. Furthermore, from a market-force perspective, the Appolonia City project assessed in the second section of this chapter demonstrates how the central government's objective of promoting local growth and supporting the private sector potentially weakens the regulatory powers of planning authorities. As the central government exploits the financial liquidity of the proponents of Appolonia City in order to alleviate the acute housing shortage in Ghana (estimated at 1.7 million units; see Daily Graphic Online 2018) the potential creation of an elite enclave and the car-dependent land use are not consistent with the sustainability of the wider region around Appolonia City. Achieving greater sustainability for the wider Appolonia City area, thus, requires enhancing the capacity and independence of planning authorities to ensure that such projects are well anchored within the wider regional plans in ways that lead to just and sustainable urban development. This includes protecting the role of experts like planners in decision-making processes for such projects.

The fuzziness and trans-disciplinary nature of sustainability as a concept has been stressed throughout this thesis (see, for example, Jabareen 2008). This means that not only urban instruments such as plans, finance mechanisms, and policies, but crucially the strategic competence of the human resources who deal with such instruments, are critical for implementing them in ways that promote a transition to sustainability. Therefore, from a human resource perspective, a transition to a trajectory of sustainability will require that decision-makers are abreast with relevant knowledge on the synergies among the various dimensions of sustainability. This includes sensitising and training decision-makers on new technologies and new sustainability ideas, as achieving greater sustainability in Ghana's urban areas in the midst of rapid urbanisation will potentially create uncertainties which

require innovative thinking. Crucially, opportunities to sensitise and train human resources are expected to enhance their capacity and competency to respond to complex social, environmental and economic issues that affect urban systems and citizens in Ghana. Overall, the quest for a transition to a trajectory of sustainability in Ghanaian urban areas requires a reshaping of the institutional capacity around sustainability in order to enhance the management of the spatial implications of rapid urbanisation and population growth. This requires pursuing an agenda for integrated sustainability planning, decision-making, and investment; as well as enhanced planning regulation enforcement mechanisms, and good urban governance.

(c) Private Sector.

From a strategic niche management perspective, 'niche' developments can emerge to promote novel visions and proffer alternative solutions for sustainability transition (see Section 2.3.4). Consequently, the sub-case-study on Appolonia City demonstrates how actors from the private sector are capitalising on the salient urban challenges in Ghana by promoting new satellite cities as 'niches' meant to challenge the status quo on urban development in Ghana. Critically, these new city projects have been purposefully designed to disrupt the current 'regime' of urban development in Ghana through articulated visions of practice, which proponents believe are superior alternatives which will enhance urban sustainability in Ghana. Using the case of sustainable transport, the review of urban challenges in Ghana in Section 4.2 highlighted the poor-quality state of transport infrastructure in Ghana's urban areas and how this has contributed to increased private vehicle use in Ghana. In the context of the Appolonia City project, a paradox emerges as its proponents pledge transport infrastructure such as pedestrian walkways and biking trails while the absence of public transport suggests that the overall design promotes private car dependency. Critically, achieving greater sustainability for the Appolonia City project and the surrounding region requires its proponents to reorient its masterplan to introduce sustainable forms of transport, including BRT, in order to mitigate long-term environmental costs due to potential private car dependency. Furthermore, while private sector developments such as Appolonia City represent avenues of experimentation through which sustainability principles could be infused into urban development, an effective transition to sustainability should involve the uptake of urban development practices which are suited to the individual conditions prevalent in most urban areas of Ghana. This includes acknowledging the legacy of the existing local areas and infrastructure. Ultimately, the discussions above have shown that the effectiveness

of ‘niche’ developments like Appolonia City in disrupting the urban development status quo into a trajectory of sustainability is not guaranteed unless careful considerations are made to tackle issues such as wider inclusivity and the role of sustainable transport in promoting sustainable lifestyles. Overall, the private sector stakeholders must maintain good corporate governance mechanisms which simultaneously ensure investment returns and mitigate externalities (social, environmental, economic) on other stakeholders and the wider urban system.

7.4.1.2 Individual and Community contexts.

While the Government of Ghana, through the various departments, is responsible for providing an efficient urban structure, the behaviour and practices of prospective users of the urban systems are critical as they are the ones who appropriate urban spaces in ways that suit their requirements. Generally, in order to realise sustainable development in Ghana’s urban areas, there must be behavioural change at the local level.

(a) Individual.

The acceptance, support, and participation of citizens are critical if a city is to successfully realise its sustainability ambitions (Laurian and Crawford 2016; Swann 2017). With residents being the target groups and primary beneficiaries of urban sustainability initiatives, there is no better opportunity to develop more effective sustainability plans, policies, and projects than by actively involving urban citizens. In general, the findings on the perceptions of citizens in Chapter Five provided useful insights that could potentially help to improve sustainability-related strategies, as well as help in the planning and implementation of policies in ways that address the nuances in opinions and attitudes of citizens towards urban sustainability. For example, as it was found that citizens expressed a high willingness to engage in sustainability-enhancing practices such as recycling, efforts should be made to influence the behaviour and attitudes of individual citizens towards sustainability action. Such actions could be realised through education programmes that are geared towards increasing the level of awareness of the sustainability-related policies, projects and plans amongst local citizens.

(b) Community.

In addition to individual actions, participatory community action is required to induce a transition to sustainability in Ghana's urban areas. This arises out of the need to mitigate the weakened capacity of the government to promote urban sustainability due to issues such as weak planning and regulatory frameworks, inadequate finance, and politics, as has been stressed throughout this thesis (see, for example, Bryceson et al. 2009; Turok and Parnell 2009; Bekker and Therborn 2012; Fox 2014). Generally, participatory community action could promote voluntary and locally-led sustainability solutions. These include, but are not limited to, recycling initiatives, sustainable energy initiatives and sustainable transport initiatives. For example, with increasing private car dependency and its attendant environmental impacts in Ghana's urban areas (see Section 4.2), participatory community action could promote a shift toward sustainable lifestyles through initiatives such as car sharing and walking clubs. Local urban communities could also stimulate a transition to sustainability by generating knowledge about aspects of sustainability through participatory community research. Furthermore, as has been maintained throughout this thesis, sustainable development is a dynamic process. Thus, from a sustainable community development perspective, transitioning to sustainability requires resilience such that communities can adapt to changes accompanying the transition. Overall, it is expected that community-led action could potentially facilitate a bottom-up transition to a trajectory of urban sustainability by mitigating government inaction on sustainability-related issues or where existing, augment the government's sustainability efforts.

7.4.2 Conceptual model for adaptive response towards urban sustainability transition in Ghana.

An ideal model for an adaptive response towards a transition to urban sustainability in the Ghanaian context is shown in Figure 7.7. Rather than a grand conceptual model, Figure 7.7 captures the complexity of the interactions between urbanisation and sustainable development in Ghana through a reflection on the findings of this thesis. By modifying the response component of the DPSIR-framework (see Figure 2.4), Figure 7.7 tentatively emphasises how various actors and policies could potentially influence urban sustainability transition processes and reposition Ghana's urban areas onto a trajectory of sustainability. Ultimately, the conceptual model presented in Figure 7.7 demonstrates how the adaptive responses of various actors are important for creating the necessary conditions that will enhance the capacity of Ghana's urban areas to transition to sustainability. Rather than

propose responses top-down or bottom-up, it presents balanced and multiple practical starting points (for example, citizens, private sector, government) for inducing a transition to sustainability. Consequently, the relevant findings were sorted into the respective components of Figure 7.7 and are summarised as follows:

(a) Drivers.

The main drivers which shape the state and trajectory of urban sustainability in the study have been identified as urbanisation and sustainable development (environmental, social, economic) processes.

(b) Pressures.

The pressures identified encompass those that result from anthropogenic activities in the local urban areas, as well as at the regional level that could potentially exacerbate conditions in local urban systems, and these include: globalisation / neo-liberalism; poverty; and resource use / depletion.

(c) State.

As an indication of the system-wide influence of the identified pressures on urban areas, the following 'State' variables were identified: landscape; demography; and human well-being.

(d) Impacts.

The effects of the pressures on the urban system states have created localised impacts on aspects of the urban systems, and these have been identified to include: land cover; urban form; population; and living standards.

(e) Responses.

As indicators of responses to mitigate the impacts of urbanisation and sustainable developments, and to manage these processes in ways which facilitate a transition to a trajectory of sustainability in Ghanaian urban areas, the following relevant 'responses' were identified: government (institutional); citizens and communities; and corporate or private sector. Specifically, in order to enhance urban sustainability, the government must: pursue policy and institutional reform for sustainability; make policy prescriptions for poverty reduction and sustainable resource use; pursue integrated sustainability planning, decision-making and investment; enhance planning enforcement regimes; and pursue overall good

urban governance. The corporate / private sector must: pursue good corporate governance which ensures that their activities promote environment stewardship and pursue innovative approaches to urban development which deliver sustainable urban forms. Citizens and communities must exude positive behaviour and attitude towards urban sustainability. Overall, the synergistic effects of the responses will be maximised through coordinated partnerships among the various relevant stakeholders.

In terms of the inter-linkages between the components of the conceptual model, Figure 7.7 shows how urbanisation and the pursuit of sustainability generate 'pressures' (for example, poverty and resource depletion) which alter the 'state' of aspects of urban systems (such as landscape and demography). The 'pressures' and 'state' components create 'impacts' that affect aspects of urban systems (including land cover, living standards and population). The inter-linkages among the 'drivers', 'pressures', 'states' and 'impacts' trigger 'responses' that aim to mitigate cumulative effects of these inter-linkages. Adaptive 'responses' from the Government (for example, through integrated sustainability planning), Private Sector (for example, through sustainable urban form designs) and, Communities and Citizens (for example, through change in attitudes) are expected to facilitate a transition to sustainability by mitigating the 'impacts' of the interactions between urbanisation and sustainable development. Adaptive 'responses' from the Government (for example, through integrated sustainability planning, and policy prescriptions for poverty reduction and resource use) are expected to improve the 'state' of aspects of urban systems (for example, demography, landscape and human well-being) and to minimise the effects of 'pressures' on urban systems. Adaptive 'responses' from the Government (for example, through policy and institutional reform for sustainability) and Private Sector (for example, through good corporate governance) are expected to promote sustainable development and sustainable urbanisation. The adaptive 'responses' are expected to regulate the interactions between urbanisation and sustainable development, and thereby contribute to a transition to urban sustainability.

Critically, Figure 7.7 potentially shows that the DPSIR framework could be useful for promoting the transition to sustainability. For example, within this thesis, the framework has facilitated problem identification by helping to highlight and frame problems that emanate from the interactions between urbanisation and sustainable development. This is evidenced by how 'drivers' (for example, urbanisation and economic development) and 'pressures' (for

example, poverty and globalisation) were identified to affect 'state' (for example, landscape) and 'impact' (for example, land cover and living standards) aspects of urban systems. Therefore, the framework could prove useful in the practical realm of urban development where issues that affect the complex interactions between urbanisation and sustainable development have to be identified and structured for decision-making. The DPSIR framework has also facilitated an appreciation of the interactions across the different parts of the urban socio-ecological system. For example, Figure 7.7 shows how 'pressure' factors alter 'state' factors, and how these factors are, in turn, minimised or mitigated by 'response' factors. In the arena of urban development practice, acknowledging and understanding interactions between the multiple aspects of an urban system could be essential for achieving positive sustainable outcomes. Furthermore, the DPSIR framework has helped to generate possible solutions that could ameliorate the problems and impacts emerging from the interactions between urbanisation and sustainable development. The 'response' factors (for example, citizen and government) in Figure 7.7 are evidence of the multiple pathways through which urban sustainability transition could be achieved. Stimulating a transition to urban sustainability in real life possibly requires designing a range of strategies that provide pathways and solutions for meeting urban sustainability goals. Overall, Figure 7.7 shows that the DPSIR framework could be operationalised to promote the transition to urban sustainability if it is appropriately modified or improved.

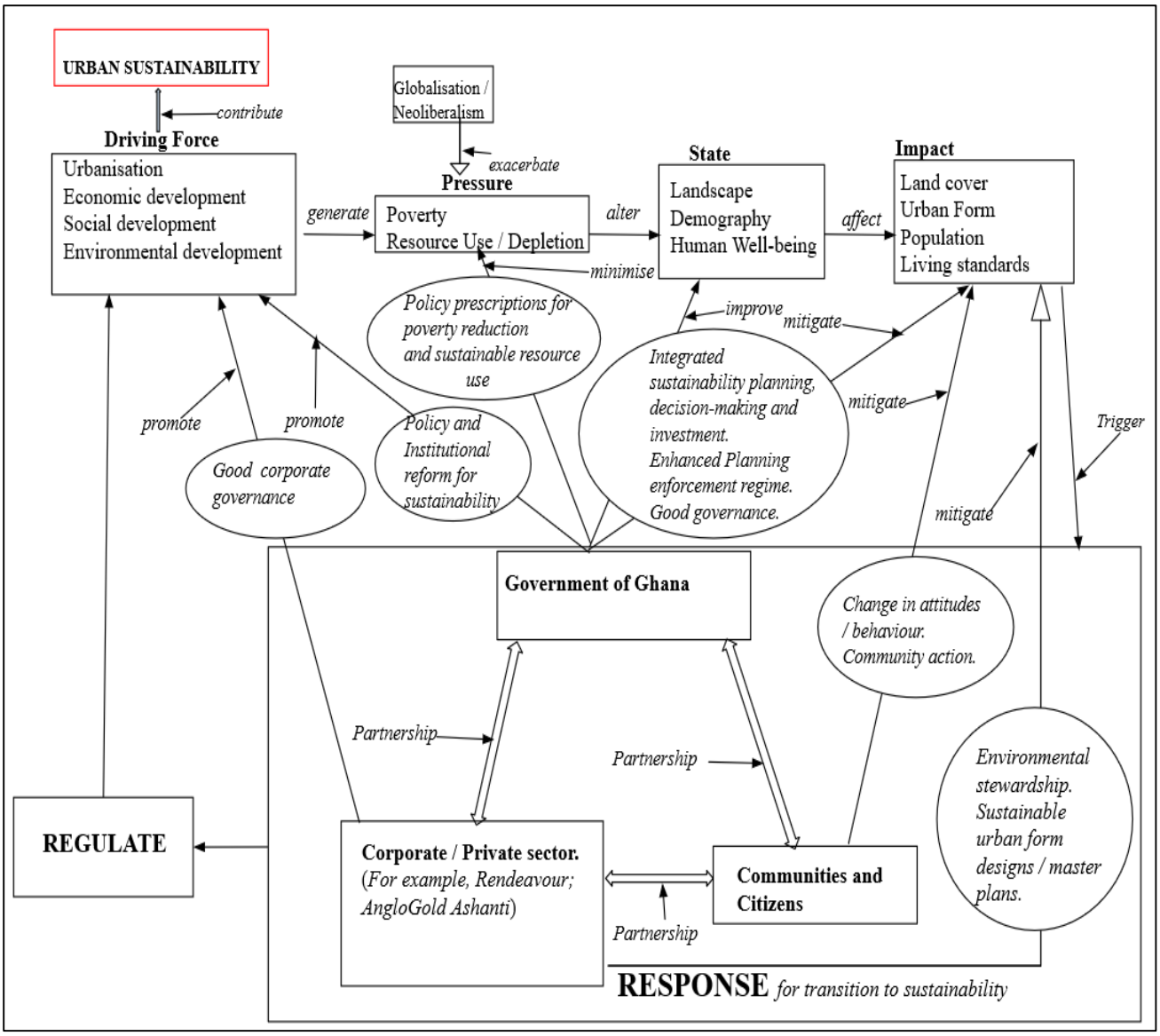

Figure 7.7: Adaptive DPSIR-based conceptual model for urban sustainability transition in Ghana.
Source: Author's analysis (as modified from OECD 1994; EEA 1995; and IEHIAS 2019).

Chapter Eight

8. Conclusions

8.1 Introduction

The purpose of this study was to explore the relationship between urbanisation and sustainable development in the context of Ghana in order to make recommendations for urban sustainability, and to develop a conceptual model that could facilitate and enhance evidence-based decision-making for the transition to sustainability. Thus, in the next section, a summary of the salient issues identified in the literature review on urbanisation and sustainable development is provided, and conclusions are made in the context of the six specific objectives of this study. These were:

(1) To apply a conceptual framework that organises the interactions between urbanisation and sustainable development in an integrative and holistic manner.

(2) To evaluate the urbanisation trends and the sustainable development situation in Ghana.

(3) To provide a deeper understanding of the Ghanaian situation through a comparative urban sub-case-study (Kumasi and Obuasi) that specifically: (i) examines the patterns of landscape and demographic urbanisation and the implications for sustainable development; (ii) evaluates the sustainable development situation based on recognised indicators from the literature; and (iii) explores urbanisation and sustainable development based on the subjective experience (perceptions) of citizens.

(4) To examine the sustainability construct and operationalisation in Ghana's urban policies in order to determine their consistency with the principles of sustainable development.

(5) To examine sustainable city development in Ghana through a sub-case-study (Appolonia satellite city) in order to establish the extent to which it aligns with sustainability as a concept.

(6) To suggest recommendations for urban sustainability transition and to develop a conceptual model that could facilitate and enhance evidence-based decision-making for the transition to urban sustainability in Ghana, and by extension, SSA.

The third section of this chapter presents the policy implications and recommendations. The fourth sector reconsiders the study's findings in the context of the concepts of sustainability transition and sustainable urban transformation. The fifth section is an evaluation of the validity of the study. The sixth section of this chapter presents the limitations and pointers for further research. The seventh section is a summary that reinforces the key contribution to knowledge in the context of the overall study.

8.2 Summary of critical issues and main conclusions

8.2.1 The extent to which knowledge of urbanisation and sustainable development can be organised within a DPSIR conceptual research framework model.

Applying the DPSIR framework (Figure 2.4) to organise knowledge in this study addressed the first objective of this research and showed that: the concepts of urbanisation and sustainable development constitute driving forces which shape the functioning of urban areas; the interactions between urbanisation and sustainable development generate 'pressures' including poverty, globalisation, and resource depletion which alter the 'state' of urban systems and affect variables including demography, landscape, and human well-being (see Chapter Two); the 'impact' of the alteration of urban systems include changes to land cover, urban form, population, and living standards (see Chapters Four and Five); and 'responses' from relevant stakeholders are required in order to mitigate the 'pressures', improve the state of urban systems, and mitigate impacts of changes to land cover, urban form, population, and living standards (see Chapters Four, Seven and Eight). An important caveat for evaluating the usefulness of the DPSIR framework applied, however, is that the variables identified are not exhaustive representations of all possible 'pressures', 'impacts', 'states' and 'responses' on the urbanisation and sustainable development processes in Ghana, but are exclusively based on the literature reviewed and data available for this study. Notwithstanding, the lesson of the application of the DPSIR framework in this study is that examining the interactions of disparate concepts such as sustainable development and urbanisation stimulates a rethinking of the assumptions and methods that guide the valid construction of knowledge, as evidenced

by the pragmatic philosophy adopted for this research. Overall, in light of the complexity of the interactions between urbanisation and sustainable development, as well as a lack of a comprehensive framework for evaluation (Jabareen 2008), the application of a DPSIR conceptual framework addressed the first objective of the research as it enabled a holistic and integrative analysis of the concepts that were examined.

8.2.2 An overview of urbanisation and sustainable development in the Ghanaian context.

Chapter Four addressed the second objective of this study by presenting an assessment of urbanisation patterns and the overall sustainable development in Ghana based on four primary dimensions identified from the Brundtland Commission's definition of sustainable development (WCED 1987; Holden et al. 2014) which include: (i) the extent to which the basic needs of citizens are being met; (ii) how ecological sustainability is being safeguarded; and (iii-iv) how both inter- and intra- generational equity are being maintained. The findings highlighted the unsustainable nature of development in Ghana as evidenced by an ecological footprint that has exceeded bio-capacity; increasing Gini co-efficient scores (as a measure of widening inequality); increasing HDI scores (as a composite measure of the extent of progress on attaining the basic needs of education, health, and income); and a decreasing renewable energy component of total primary energy. As sustainable development advocates for a form of development that ensures a balance in environment, economic, and social considerations, the sustainable development space graphs produced highlighted how Ghana was failing to meet threshold conditions beyond or within which development could proceed in a sustainable manner. The findings demonstrate that focusing only on achieving socio-economic development will not be conducive to protecting ecological integrity and ensuring inter- and intra-generational justice. The fundamental argument that emanated from these findings, thus, is that although Ghana has made significant strides towards promoting overall development, it is imperative that it pursues development in a sustainable, equitable, and inclusive manner; and more importantly, within the planetary boundary. Consequently, the political nature of SD as a concept means that the extent to which SD is pursued in the Ghanaian case will be determined by the importance the Government attaches to its achievement. This means that despite Ghana's developmental challenges, political choices could still be made that affect overall sustainable development. These choices include, but are not limited to, ensuring equality of opportunity irrespective of gender, generation (current or present), socio-economic status, etc., such that citizens are not left behind by economic

progress, social mobility, and environmental conditions. Overall, this part of the research represents a first attempt to frame a holistic perspective of SD in Ghana based on the primary dimensions of sustainable development, as advanced within the Brundtland Commission's definition of sustainable development.

This study also provided an overview of the overall urbanisation patterns in Ghana. Broadly, the findings showed that Ghana's urbanisation has reached unprecedented levels, with the proportion of the country's population living in urban areas increasing from 15% in 1950, to 51% in 2010 (Cobinnah and Niminga-Beka 2017). The key driving factors shaping the urbanisation process in Ghana were identified to include internal ones such as demographic shifts and market forces, and external ones such as globalisation. By juxtaposing the findings on Ghana's sustainable development and urbanisation in a discussion, Chapter Four highlighted the sustainability implications of urbanisation in Ghana and demonstrated the complexity of the interactions between urbanisation and sustainable development at the national level. For instance, market forces have increasingly shaped Ghana's urbanisation process since the implementation of the structural adjustment programmes (SAPs) recommended for Ghana's economic transformation in the 1980s, by facilitating the provision of urban infrastructure and services. Nevertheless, the characteristics of market forces tend to reinforce inequality and unemployment, and exacerbate environmental impacts, thereby undermining the positive sustainability impacts of urbanisation in Ghana. Essentially, the findings in Chapter Four support arguments about how rapid urbanisation inflicts a multitude of diverse challenges on the achievement of sustainable development (Allen 2009; Zhou et al. 2015). Consequently, it is argued that rapid urbanisation in Ghana complicates the achievement of sustainable development due to a constellation of factors, including existing low levels of development, the effects of market forces, and the desire to safeguard the basic needs of an increasingly urban population.

8.2.3 The extent and depth of interactions between urbanisation and sustainable development at the local urban level in Ghana.

Chapter Four framed a national perspective on urbanisation and sustainable development in Ghana. As the impacts of the interactions of sustainable development and urbanisation manifest at the local urban level, it was necessary therefore, to deepen this national assessment and explore the interactions between urbanisation and sustainable development in

the local urban areas in Ghana. Chapter Five narrowed the focus to the local urban level and addressed the third objective of this research by developing comparative a sub-case-study on two urban areas in Ghana, namely Kumasi and Obuasi. The first investigation focused on the sustainability implications of demographic and landscape urbanisation in the two study sites. By classifying satellite imagery, landscape urbanisation in the two study sites was assessed through a spatio-temporal classification of land cover over the period 1986-2018. The findings of the study highlighted how the urbanisation process in Kumasi and Obuasi has stimulated the expansion of built-up (urban) land cover mainly at the expense of natural land cover. Specifically concerning urban expansion, the findings presented have shown that between 1986 and 2018, the built-up share of Kumasi's land cover expanded by over 1,105%, compared with Obuasi where built-up land cover expanded by over 144%. While the different rates of urban expansion between Kumasi and Obuasi could be attributed to differences in city size and administrative hierarchy, the findings reinforced the national level observation about how market forces shaped changes in land cover and the subsequent urban form. In a country such as Ghana where planning enforcement is weak, the expansion of built-up land cover due to the forces of urbanisation is noticeable and significant. For example, the thematic maps produced showed built-up land cover in Kumasi had expanded and transcended the city's administrative boundaries into adjoining districts, changing its urban form in the process. Critically, the findings of the study, thus, demonstrate how human-induced development in Obuasi and Kumasi can aggravate changes in land cover and result in urban forms that undermine sustainability. In the broader context, the study demonstrated how visualising the extent of urban expansion at the expense of natural land cover can be a relevant input for analysing the sustainability implications of landscape urbanisation as they were identified to include aspects of development such as food security and urban form.

In terms of demographic urbanisation, the study provided an overview of changes in the populations of Obuasi and Kumasi over the period of 1986-2019. Consistent with national level demographic urbanisation, the findings highlighted a significant shift in the population in both study areas between 1986 and 2019, as Kumasi's population quadrupled while Obuasi's population tripled. These changes were fundamentally shaped by factors identified in Chapters Two and Five including migration, market-forces, and natural population growth; and consistent with the literature (see, for example, Ferguson 1999; David and Arman 2014), the urbanisation process in the two areas has also been shaped by the prevailing economy. In sum, the findings provided a nuanced understanding of urbanisation in Kumasi and Obuasi as

they demonstrated that the process does not merely result in changes in landscape and population, but it is multi-dimensional and involves changes in population, landscape, development, and society.

The second investigation in Chapter Five was an assessment of the sustainability implications of urbanisation in Kumasi and Obuasi based on selected socio-economic indicators. The study assessed the performance of the study areas based on indicators related to education, life expectancy, and living standards. In general, the findings of the study lent credence to the argument about how the agglomeration effects of urban areas enhance their levels of socio-economic development (Gong et al. 2012; Turok and McGranahan 2013; Earle 2016). The study showed how Kumasi and Obuasi, by virtue of their 'urban state', offered better opportunities for improved living standards compared with overall national performance (based on the indices assessed). Furthermore, considering the challenges of poverty and the generally low level of development in Ghana, the study argued that the achievement of sustainable development in Obuasi and Kumasi could be undermined as the rapid population growth in these areas could erode the quality of the development opportunities they offer. This observation is significant, especially when urban population growth is deemed to have outpaced conventional planning in Ghana.

A notable contribution of this study is that it provides insights into the interactions between urbanisation and sustainable development based on the subjective experience of citizens. Consistent with the case study approach adopted, and acknowledging the paucity of data on urban areas (Smit and Parnell 2012), it became necessary, therefore, to corroborate evidence from multiple sources. Thus, the third investigation in Chapter Five examined the central themes of this study by exploring the perceptions of citizens in Kumasi and Obuasi. The findings from the survey suggest that how citizens perceive statements about urban sustainability in a particular urban area depends, to a considerable extent, on how that urban area has enabled them to maximise their potential in terms of access to socio-economic opportunities and services such as jobs, housing, education, income, as well as access to an environment with minimal negative impacts. For example, 46% of citizens in Kumasi agreed or strongly agreed to the statement on income levels, compared with 13.6% in Obuasi. In contrast, however, 84.5% of respondents in Kumasi disagreed or strongly disagreed on the statement suggesting that it is easy to find a job, compared with 88.7% in Obuasi. Furthermore, the literature highlighted how pursuing sustainable development must lead to a

balanced level of environmental, social, and economic considerations. This makes it easier to assume that the perceptions of citizens on the sustainability statements will be ambiguous. However, the findings showed a fundamental dominance of socio-economic considerations, sometimes at the expense of environmental considerations. This was evidently captured in some of the statements provided by respondents (see Appendix 3) in the 'further comments' section of the questionnaire. These observations align with earlier discussions in the first investigation about the influence of the prevailing economy, city size and administrative forces in shaping the quality of landscape and demographic urbanisation in Kumasi and Obuasi. The findings have, thus, provided valuable insight into understanding the experiential perspectives of respondents on urban sustainability–related themes in Kumasi and Obuasi. Furthermore, the findings showed how males and females, age groups and socio-economic groups responded differently to some urban sustainability statements. For example, in Kumasi, there was a statistically significant difference between how females responded to the statement on access to healthcare, as well as statistically significant differences among the responses by those who are 'Employed with wage', 'Self-employed' and 'Unemployed'. Therefore, the findings support arguments in the literature about how the sustainable development experience of citizens is shaped by issues such as gender roles, age, and socio-economic characteristics (see, for example, Tuncer 2008; Olsson and Gericke 2016; Aina et al. 2019). Therefore, to align with the egalitarian nature of sustainable development as a concept, those factors must be taken into account during sustainability decision-making.

Citizens' acceptance and participation in sustainability-related activities are important for achieving wider sustainability in urban areas. According to the findings, respondents in Kumasi and Obuasi strongly support pro-sustainability behaviour as over 90% of them were willing to participate in recycling, patronise public transport, and conserve water and energy. Thus, the findings of the study are an indication of the potential for citizens to adopt pro-sustainability values, attitudes, and practices which can enhance the pursuance of wider urban sustainability. Furthermore, the findings of the survey reinforce the role of citizens as a key component of the sustainability agenda in Ghanaian urban areas. Essentially, the findings showed that the interactions between urbanisation and sustainable development in Kumasi and Obuasi were not sustainable when the trade-offs between positive impacts (for example, improved living standards) and negative impacts (for example, uncontrolled urban expansion) were considered. Overall, by developing the comparative sub-case-study, Chapter Five provided deeper insights and enhanced the limited knowledge on the interactions between

urbanisation and sustainable development at the local urban level in Ghana, and by extension, SSA.

8.2.4 How does policy interpret and apply the principles of sustainability in order to manage contemporary and future urbanisation towards sustainability?

Chapter Six addressed the fourth objective of this research by examining the sustainability construct and operationalisation in Ghana's National Urban Policy and Action Plan. By assessing the content of the NUP and AP using an evaluation matrix based on selected dimensions of the UN-Habitat's City Prosperity Index (CPI), the study found that the NUP and AP provide adequate scope for the sustainability of urban areas in the context of the CPI dimensions. By using the World Bank's urban sustainability framework as a lens of analysis, the study discussed the sustainability context of the NUP and AP under themes that included urban economies, fiscal sustainability, inclusivity and quality of life, natural environment and resources, climate action and resilience, and governance and integrated planning. Demonstrating the gaps in the sustainability construct of Ghana's NUP provided a basis for identifying challenges to its sustainability operationalisation which include, but are not limited to, rhetoric tendencies, political barriers, and an unbalanced consideration of the various dimensions of sustainability. Essentially, the findings suggest that in its current form, the alignment of the NUP to sustainability principles is limited. Overall, by assessing the NUP and AP, this study framed a perspective on the extent to which sustainability principles are embedded in policy-making for urban sustainability in Ghana. It was argued that realising the multiple objectives of the NUP would require the urgent integration of the various dimensions of sustainability in a non-discretionary manner, such that power relations are well-managed and the policy objectives are coordinated with other independent government policies (for example, housing policy) to achieve wider sustainability.

8.2.5 To what extent can innovative approaches to sustainable city development be adapted to shape sustainable urbanisation within the African context?

An argument that emanated from the review of literature in Chapter Two was how the utopian ideals of the innovative approaches to sustainable city development (for example, eco-cities and smart cities) potentially undermine the development of sustainable cities in SSA. This is because they have been mainly implemented in wealthier countries, and their

designs and characteristics tend to overlook the exceptional circumstances that undermine sustainable development in SSA including, but not limited to, low development levels, lack of financial resources to support infrastructural development, weak institutions, and weak enforcement of planning regulations (Bryceson et al. 2009; Turok and Parnell 2009; Bekker and Therborn 2012; Fox 2014). Therefore, the first part of Chapter Seven addressed the fifth objective of this research by examining the development of sustainable cities in Ghana through an evaluation of the Appolonia City project. The sub-case-study on the Appolonia City project provided a synthesis of sustainable city development in Ghana as Appolonia City's (un)sustainability was assessed by juxtaposing it in an evaluation matrix with the sustainable urban form features of an eco-city proposed by Jabareen (2006). The findings showed that Appolonia City's characteristics contained features that could enhance wider urban sustainability, compared with 'business as usual' urban development in Ghana. For example, the project promoted the use of sustainable energy forms including solar energy, promoted urban greenery, and promoted mixed land use. These desirable features of the Appolonia City project provide diverse sustainability benefits which are explained in Table 2.1. Conversely, certain features of the Appolonia City project were deemed to potentially undermine its sustainability benefits. For example, despite proposing to host up to 100,000 residents, the project characteristics did not highlight any plans for a sustainable form of transport. This suggests that the project inherently promotes private car dependency. The dominance of private car use is expected to contribute to increased GHGs which erodes the sustainability benefits provided by a desirable feature such as urban greenery (see Table 2.1). Critically, the study argued that the Appolonia City project did not fully align with the normative visions of a sustainable city promoted in Chapter Two. Following that, the study discussed the main barriers of sustainable city development in Ghana to include finance and politics, as the implementation of sustainable city concepts requires substantial financial resources and political will. Overall, the findings on the Appolonia City project facilitated a deeper understanding of how the essential characteristics of contemporary sustainable city development in Ghana contributes to or undermines wider urban sustainability.

8.2.6 Towards a trajectory of sustainability in Ghanaian urban areas: recommendations and a conceptual model to facilitate evidence-based decision-making.

By juxtaposing and consolidating the findings that exposed urban challenges in Ghana in Chapter Four; the findings on overall sustainable development and urbanisation in Ghana in

Chapter Four; and the findings on urbanisation and sustainable development at the local urban level through the comparative sub-case-study in Chapter Five, this study demonstrated that, in its current form, development in Ghanaian urban areas is not proceeding in a sustainable manner. Subsequently, while not dismissing the transformative strengths of innovative approaches to sustainable city development such as eco-cities and smart cities, the findings on the (un)sustainability of the Appolonia City project highlighted the difficulties in applying these concepts within the SSA context. Against this backdrop, this study argues that a transition to a trajectory of sustainability is required in order to enhance sustainability in Ghana's urban areas.

In making recommendations for a transition to a trajectory of urban sustainability, the study argues that there is no 'one-size fits all' formula for stimulating a transition. The different economic, political, and geographic situations in Ghana's urban areas imply that rather than prescribe a particular set of characteristics for developing sustainable cities, the relevant stakeholders should adopt an eclectic mix of solutions from the various approaches to sustainable city development and adapt them to the needs and characteristics of particular urban areas. Notwithstanding, based exclusively of the findings and observations in this research, the study discussed recommendations which could facilitate the transition to a trajectory of urban sustainability in Ghana's urban areas. The recommendations generally highlighted the need for: institutional and policy overhaul for sustainability outcomes; citizen and community action and behaviour for sustainability; and corporate or private governance practices that promote a healthy balance between investment returns and sustainable development.

A key highlight from this study's findings is that the transition to sustainability in Ghana's urban areas is in the nascent stage, if it exists at all. Therefore, Chapter Seven further addressed the sixth objective of this research by adapting the study findings and modifying the DPSIR framework (Figure 2.4) in order to develop a conceptual model (Figure 7.7) that promotes evidence-based decision-making in the context of facilitating the transition to a trajectory of sustainability in Ghana's urban areas. Essentially, the conceptual model developed in Figure 7.7 provided a better understanding of the interplay between urbanisation and sustainable development in Ghana in a holistic manner, and its adaptive responses serve as a predictor of the potential ability of the dynamic constellation of diverse stakeholders to shape the urban development process in ways that could stimulate a transition to a trajectory

of sustainability in Ghanaian urban areas. The model is consistent with the principles of SD and contributes to the important dialogue about the future of urban areas in SSA. Overall, as a first step, the study has provided a more reliable integration of disparate data on urbanisation and sustainable development in Ghana, and shows promise as a foundation based on which evidence-based decision-making on urban sustainability in Ghana, and by extension, SSA, could proceed.

8.3 Policy implications and recommendations

The findings of this research present many implications. The evidence of this study highlights the importance of the interactions between urbanisation and sustainable development for the overall sustainability of urban areas in Ghana and, by extension, SSA.

(1) The evidence of the study in Chapter Four shows that the overall development situation in Ghana is not sustainable, especially in terms of balancing resource use with the need to safeguard the basic needs of citizens, as well as ensuring inter- and intra- generational justice. These findings have implications for overall development policy as they suggest that sustainable development principles are undermined. Therefore, if development in Ghana is to be consistent with the principle of sustainable development, policy-makers must ensure that meeting one goal does not compromise the possibility of meeting another goal. In this context, legal and resource provisions should be made to ensure that a policy set such as the 7-year Coordinated Programme of Economic and Social Policies (2018–2024) equally safeguards the environment while delivering its objective of creating jobs, prosperity, and equal opportunities for Ghanaian citizens.

(2) Considering the evidence on landscape and demographic urbanisation at the local urban level in Chapter Five, the findings are helpful for policy-makers to better understand the complexity of the relationships among land use and land cover change, demographic shifts, and sustainable development. The findings on land cover patterns are potentially useful for providing guidance on better management of future land use as they help to map the extent to which different land cover classes are changing at temporal and spatial scales. As the extent of land cover change has implications for sustainability in Ghana's urban areas, it is recommended that emerging landscape management approaches are adopted to guide future land use planning. Furthermore, to remedy the poorly managed expansion of Ghana's urban

areas, relevant urban development institutions such as the National Development Planning Commission (national level) and the Town and Country Planning Department (local level) should be well resourced and granted the appropriate powers to enforce development controls and regulations without interferences.

(3) Considering the evidence on the perspectives of urban citizens in Chapter Five, the findings have policy implications in the context of citizen engagement for sustainable development. The evidence of the study is an indication of the subjective experiences of citizens, and the findings suggest that the perspectives of citizens on urban sustainability are dominated by socio-economic considerations, sometimes, at the expense of environmental ones. The findings also showed differences in the perspectives of citizens based on gender, age and economic factors. This makes it imperative to sufficiently engage urban citizens and incorporate their values and preferences in sustainability policy-making and planning. The evidence of the study relating to respondents' positive attitudes towards pro-sustainability practices in Kumasi and Obuasi also have implications for the role of citizens in steering Ghana's urban areas onto trajectories of sustainability. This requires setting the necessary preconditions for citizens to actively engage in pro-sustainability behaviour. The necessary preconditions include, but are not limited to, providing basic infrastructure such as kerbside recycling systems and public transport systems (such as BRT).

(4) The findings have policy implications for sustainable city development and the transition to sustainability in Ghana's urban areas and beyond. The poverty and institutional capacity situation in Ghana suggest that it might be unreasonable to expect the implementation of a particular approach to sustainable development to explicitly and successfully address the various challenges (see Chapters Four, Five, and Seven) that threaten the sustainability of Ghanaian urban areas. This will require a more coordinated approach to development where there is full alignment of the national urban policy to the principles of sustainable development, and where partnerships among government institutions, citizens, and the private sector in creating and implementing visions for a transition to sustainability are reinforced. For example, by taking Ghana's housing deficit (estimated at over 1.7 million units) and the focus on slum upgrade in the NUP into consideration, it is evident in this thesis that the interactions between market forces and the complex land tenure system affect the provision of socially inclusive urban housing. Therefore, policy provisions must target partnerships and collaborations between stakeholders such as the Ministry of Local

Government and Rural Development (MGLRD), the Ministry of Lands and Natural Resources (MLNR), Lands Commission, municipal authorities, utility service providers (e.g. Electricity Company of Ghana), traditional leaders, and local communities, in order to accelerate urban housing delivery by identifying and developing legally acquired land. Such partnerships should ensure that the housing needs of low-income citizens, as well as the socially, economically, and politically hegemonic citizens, are equally and adequately catered for.

(5) The findings of this study have policy implications for evidence-based urban sustainability decision-making in Ghana. The literature reviewed and the breadth of the DPSIR framework applied to organise knowledge in this study support an integrative analysis of the different dimensions of sustainability, and highlighted the sheer volume of indicators required to measure components of urban systems for decision-making. Considering the paucity of urban data in SSA (Smit and Parnell 2012), systematic efforts are required to enhance data availability and access in order to promote evidence-based decision-making for the urban sustainability transition in Ghana.

8.4 Re-assessment of sustainability transitions and sustainable urban transformation

The literature reviewed in Chapter Two highlighted the need for radical and structural shifts within urban systems in order to achieve sustainable urban societies (Rotmans and Loorbach 2009; Markard et al. 2012). However, it was argued that the sustainability transition concepts and theories (for example, transition management, strategic niche management) that have emerged to guide sustainable urban transformation have focused mainly on specific sectors of urban systems such as energy and health, rather than holistically capture transitions at all levels of urban systems (Coenen et al. 2012). A key point of departure from Chapter Two was the need to consider sustainability transition and transformation from an overall urban spatial context. On the basis of the findings in this study, it can be argued that the transition concepts and theories are helpful for understanding the particularities of the adaptive responses for a transition towards a trajectory of urban sustainability in Ghana. For example, from a transition management perspective, Figure 7.7 highlighted the need for a more coordinated partnership and interaction among various actors (for example, government, citizens, and private sector) in order to facilitate a transition to urban sustainability. From a multi-level perspective, the NUP, for example, represents a redirection of the national

strategy towards sustainable urbanisation at the 'landscape' level, while a change in attitude and behaviour at the local level by citizens represents a 'niche' which could potentially challenge and stimulate change in existing 'regimes' (for example, positive behaviour towards pro-sustainability initiatives). Furthermore, from a strategic niche management perspective, the Appolonia City project, for example, represents a 'niche' that has been deliberately created and supported (based on visions of a sustainable city) in order to induce change in 'business as usual' urban development 'regimes' in Ghana towards more sustainable outcomes. However, as the findings in this study have shown, development in Ghana's urban areas is proceeding in an unsustainable manner. The sustainability of development in Ghana's urban areas is further undermined by structural and institutional challenges such as poverty, weak institutions and out-dated regulations (Bryceson et al. 2009; Turok and Parnell 2009; Bekker and Therborn 2012; Fox 2014). As a result, while a transition to urban sustainability may be observed over a long period of time, it can be argued that urban sustainability transition in the SSA context is non-existent or, at best, nascent. Furthermore, the transition concepts and theories have been mainly generated and applied in Europe where the preconditions for a sustainability transition may generally exist (see, for example, Loorbach and Rotmans 2010). This raises a question over how far these theories and concepts are transferable to the SSA context where the preconditions for sustainability transitions do not exist. Therefore, it is argued that the extent to which the concepts and theories of sustainability transition 'hold' in the SSA context is limited.

8.5 An assessment of the validity of this research

Considering the lack of a theoretical framework to study the interactions between the concepts of urbanisation and sustainable development due to their disparate nature, the pragmatic philosophy adopted in this study allowed the adoption of a DPSIR framework to guide this research. Considering the paucity of data on urban areas in SSA (Smit and Parnell 2012), a strength of this study is its deployment of mixed methods and a multiple case study approach in order to collect and organise data on the interactions between urbanisation and sustainable development from multiple sources. The initial stage of this research involved an in-depth review of the extant literature on urbanisation and sustainable development in order to identify gaps and fortify the theoretical foundations of this research. The initial stage of the research was essential as it resulted in a pilot study which laid the foundations for the main stage of the research, which represents a detailed attempt to examine the interactions between

urbanisation and sustainable development in SSA based primarily on evidence available and accessible from Ghana. In doing so, the research has framed a perspective on the sustainable development and urbanisation situation in Ghana. The sub-case-studies developed provided a deeper understanding and subtle insights into the interactions between urbanisation and sustainable development at the local urban level. Critically, the case study approach made it possible to provide evidence on processes that were not directly observable, such as the perspectives of citizens. In essence, the mixed methods and multiple case study approach adopted enabled the study to fully explore the predefined categories of analysis based on the research objectives.

The comparative approach adopted for the sub-case-study at the local urban level is a key attribute of this research as the complexity of the relationship between urbanisation and sustainable development means that the majority of research on those processes has been based on the analysis of single study sites. Concerning study site selection, Kumasi could be classified as a large-sized urban area as it has a population of over 2 million, while Obuasi, with a population of just over 200,000, could be classified as a medium-sized urban area. The selection of Kumasi and Obuasi as study sites was important as it helped broaden the research on urbanisation and sustainable development whose focus has mainly been skewed towards large-sized urban areas. The case study sites were characteristic of the broader SSA region where the economies of countries are dependent on natural resource extraction, as they represent a mix of a resource-based city and a big city. Essentially, the comparative approach adopted facilitated an understanding of the complexity, diversity, and differences in the manifestation of the interactions between urbanisation and sustainable development at the local level which otherwise would not have been possible.

8.6 Limitations of the study and suggestions for further research

Despite the policy implications of this study, a number of limitations are identified. Like many less-developed regions, research in SSA is undermined by financial constraints which result in a paucity of published data. Thus, reinforcing the notion on which this study was premised, which suggests that there is a paucity of data on urban areas in SSA (Smit and Parnell 2012), significant gaps in available data on urbanisation and sustainable development were encountered, especially at the urban level where the tangible impacts of interactions between urbanisation and SD could be most practically captured. In general, while the

findings based on Ghana are in the context of SSA, structural and economic conditions potentially differ from country to country, thus limiting the extent to which the findings could be generalised in the SSA context. Further research could, therefore, offer deeper insights on the complex interactions between urbanisation and sustainable development by developing comparative studies on multiple countries and urban areas within SSA. Consequently, the identified limitations and suggestions for further research, as specifically related to the study objectives, include the following:

(1) The first set of limitations identified concern the conceptual model proposed (Figure 7.7). As shown in the literature reviewed, conceptual models are shaped by particular concepts and theories and are developed based on long-term and inter-generational considerations (Todorov and Marinova 2011). This was evident in the DPSIR conceptual framework (Figure 2.4) applied in this study as its structure assumed a seamless transition between 'pressures', 'states' and 'impacts' on the one hand, and responses on the other hand. This provided no consideration for uncertainty. Despite the limitations posed by the choice of conceptual framework proposed, it was argued in Chapter Two that there is no best approach to modelling sustainability, but rather, a variety of approaches exist which provide varied but complementary insights into sustainability. Therefore, the core principle in sustainability modelling is that due to the various interpretations and the complexity of urban sustainability, as well as the number of approaches available, the choice of approach or model is effectively determined by what the user wants to achieve with the model (Kupiszewska 1997; Ali-Tourdert and Ji 2017). Critically, the limitations posed by the DPSIR-based conceptual model (Figure 7.7) proposed were mitigated by the manner in which the DPSIR framework (Figure 2.4) was applied in this research. The DPSIR conceptual framework (Figure 2.4) was applied in order to provide an organisational structure based on which the complex interactions between urbanisation and sustainable development in SSA could be holistically captured, and in so doing help to bridge the knowledge gap created by the paucity of data on urban areas in SSA (see Smit and Parnell 2012). The conclusions in the preceding paragraphs have shown that, to a considerable extent, the conceptual framework has been successful in facilitating a reliable integration of variable data on urbanisation and sustainable development in Ghana. Overall, while based exclusively on the findings in this study, the conceptual model proposed in Figure 7.7 has also provided a foundation based on which evidence-based decision-making for a transition to urban sustainability could proceed. Further research could, therefore, offer improvements by developing other forms of models and incorporating other sources of data

in order to deepen understanding of the interactions between urbanisation and sustainable development.

(2) In assessing the sustainable development situation in Ghana in Chapter Four, this study followed the methods proposed by Holden et al. (2014). Among the key issues which they highlighted, concerning the indicators used, was measuring ecological sustainability using the ecological footprint. They observed that the ecological footprint captured consumptions and emissions based on land areas. This means that other non-land-based issues such as emissions related to radioactivity and heavy metals are not captured, which represents a methodological weakness. Furthermore, they observed that the ecological footprint relied on GHG emissions and total energy use which could make them alternative indicators. However, they argue that a strong point for adopting the ecological footprint is because it covers more environmental issues than is possible with GHG emissions and total energy use. Consequently, considering the paucity of data on sustainable development in Ghana, the indicators and thresholds used are based on high quality sources which are robust and relevant enough to mitigate these potential methodological weaknesses. It will, therefore, be informative if future research could consider applying other relevant indicators to assess overall sustainable development in Ghana.

(3) The next set of limitations relate to the comparative sub-case-study developed in Chapter Five. First, concerning the assessment of landscape urbanisation, the extent of land cover detail was limited as a maximum of seven classes were mapped. For instance, apart from primary forest, all other forest types were classified as mixed woody vegetation. Nevertheless, the primary agenda in this research was to highlight the extent of built-up (urban) land cover in relation to other land cover types. This was achieved. Future studies could provide a more detailed and comprehensive analysis to include the other land cover types that were not captured in detail in this study. Second, a limitation of the study relates to the indicators used for sustainability assessment in the second comparative investigation on Kumasi and Obuasi. Since human well-being is central to this thesis, the indicators selected were underpinned by the Human Development Index (HDI), as the development of indicators was beyond the scope of this study. Indicators such as Maternal Mortality Rate and Crude Death Rate were the proxies used to represent life expectancy. However, as discussed in the literature reviewed in Chapter Two, the indicator selection process should be based on the careful analysis of indicators which have fundamental significance and carry a maximum

likelihood of producing accurate information, rather than just gathering data on all indicators (Shen et al. 2011). Therefore, despite issues with indicator selection, the indicators chosen were relevant and robust as they were related to the HDI, MDGs and SDGs. Critically, they were selected because the paucity of data meant that they were the indicators which had reliable, measurable, policy-relevant, and accessible data available (Joumard and Gudmundsson 2010). Future research could expand the indicator set for sustainability assessment in order to achieve a deeper understanding of the urban-level impacts in the context of sustainability.

Finally, in relation to the citizen survey, the following observations are made. In exploring the perceptions of citizens, the questionnaire used in the survey was close-ended. A shortcoming of such close-ended questionnaires is that they potentially inhibit respondents from expressing extended views. However, to mitigate this, a 'further comments' space was provided at the end of the questionnaire to record any other views which the respondents wanted to express. The crux of the matter is that considering the sample size, a more in-depth method such as a semi-structured interview was not pragmatically achievable within the financial and time constraints of this research project. Nevertheless, considering the technical nature of the urbanisation and sustainability discourse, and the reality that the sample was being drawn from the general population, the close-ended questions were appropriate for ensuring uniformity in questions asked and answers recorded. In the future, studies could infuse semi-structured questions into questionnaires in order to mitigate the depth of information challenges that emerge from using only close-ended questionnaires. Also, as stressed throughout this thesis, sustainability as a concept is multi-faceted, and a significant number of variables representing the economic, social, and environmental dimensions of sustainability could be included in a questionnaire that studies it. Nevertheless, there was a deliberate focus on the most important characteristics determined during the initial pilot study. This was necessary due to sample size and data collection restrictions. Future research could expand on these and include other sustainability variables.

(4) The study adopted the UN-Habitat's City Prosperity Index and World Bank's Urban Sustainability Framework to analyse data and frame discussions on the sustainability construct and operationalisation of Ghana's urban-related policy documents. This means that the findings and discussions were restricted to the selected dimensions and indicators used in the aforementioned index and framework. Nevertheless, as already highlighted, it was shown

in the literature review that the indicator selection process should be based on the careful analysis of indicators which have fundamental significance, as well as carry a maximum likelihood of producing accurate information, rather than just gathering data on all indicators (Shen et al. 2011). Therefore, despite the potential bias, the indices used are relevant, reliable, and internationally accepted.

8.7 What is the key contribution to knowledge of this research study?

A contribution to knowledge is provided in that the processes of urbanisation and sustainable development have been aligned and explored in depth. How these processes interact has been explored not just theoretically but empirically in the context of Ghana. In taking the study forward, a mixed methods approach has generated data which shows that urbanisation in Ghana is proceeding at a rapid pace. By following the methods of Holden et al. (2014), this research gives empirical evidence on the sustainable development situation in Ghana. The findings demonstrate that while Ghana is making progress towards sustainable development, the country did not meet the empirical thresholds adopted for which its development trajectory could be classified as sustainable. In doing so, this study makes an original contribution to scholarly literature on sustainable development in Ghana, as to the best of the researcher's knowledge, it is the first study to provide empirical evidence on sustainable development in Ghana based on the four primary dimensions extracted from the Brundtland Commission's definition of sustainable development, which include safeguarding basic needs, maintaining ecological integrity, and inter- and intra- generational equity. Crucially, the discussions on the sustainability implications of Ghana's urbanisation provide evidence of the inter-relationships between the two processes.

By developing a comparative sub-case-study on two urban areas in Ghana, this study contributes to the literature on the complexity and diversity of local impacts due to the interactions between urbanisation and sustainable development. The sub-case-study provided empirical evidence on: the intricacies of landscape and demographic urbanisation at the local urban level; the sustainability situation based on selected socio-economic indicators; and the experiential sustainability perspectives of citizens. In doing so, this study makes an original contribution to scholarly literature, as to the best of the researcher's knowledge, it is the first study to provide comparative empirical evidence on the subjective experience of the interactions between urbanisation and sustainable development based on two urban areas in

Ghana. Overall, the comparative sub-case-study demonstrates that the interactions between urbanisation and sustainable development cannot be captured holistically without sensitivity to local complexities, diversity and differences.

By examining the sustainability construct and operationalisation in Ghana's National Urban Policy and Action Plan, this study contributes to the literature on policy responses to the interactions between urbanisation and sustainable development in Ghana. Considering the reality that Ghana's NUP and AP were launched in 2012, there is limited evidence of studies that have been dedicated to assessing their performance. Therefore, this study makes an original contribution to scholarly literature, as to the best of the researcher's knowledge, it is the first study dedicated to the empirical evaluation of the sustainability construct and operationalisation in Ghana's National Urban Policy.

This study contributes to the literature on innovative approaches to sustainable city development which have been promoted to maximise the benefits and mitigate the pernicious impacts of the interactions between urbanisation and sustainable development in order to transform urban areas for sustainability. The study highlights barriers that may undermine the uptake of innovative approaches to sustainable city development in SSA. By examining the Appolonia City project, this study makes an original contribution to scholarly literature on sustainable city development in Ghana, as to the best of the researcher's knowledge, it is the first study that has empirically assessed the (un)sustainability of the Appolonia City project. Overall, this study helps to bridge the knowledge gap on barriers that undermine the uptake of innovative approaches to sustainable development in SSA.

By consolidating the findings of this study and modifying the DPSIR framework (Figure 2.4) to develop Figure 7.7, this study makes an original contribution to scholarly literature on urban sustainability transitions in Ghana, as to the best of the researcher's knowledge, it is the first study to develop a conceptual model with adaptive responses that could facilitate and enhance evidence-based decision-making for the transition to urban sustainability in Ghana and, by extension, SSA. The thesis highlights the importance of the socio-ecological DPSIR framework as a tool to simplify, understand and organise knowledge on complex and disparate concepts like urbanisation and sustainable development.

To conclude, this thesis critically adds substantially to the geographical understanding of the interactions between urbanisation and sustainable development in the SSA context, especially at the local urban level where the tangible impacts of these interactions manifest, and also from the perspective of a researcher who, as a Ghanaian national, has experienced the interactions between urbanisation and sustainable development in Ghana to a considerable extent.

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Appendices

Appendix 1: Summary of key studies consulted in establishing indicators for sustainability assessment.

Authors and year	Title	Journal	Issue and page	No. of Indicators
Mutisya and Yarime 2014	Moving towards urban sustainability in Kenya: a framework for integration of environmental, economic, social and governance dimensions	Sustainability Science	9; p. 205-215	19 environmental, social, economic, and governance dimensions indicators
Turcu 2013	Re-thinking sustainability indicators: Local perspectives of urban sustainability.	Journal of Environmental Planning and Management	56 (5); p. 695-719	24 indicators covering institutional, environmental, economic, and social sustainability.
Yang et al. 2016	Urban sustainability assessment of Taiwan based on data envelope analysis	Renewable and Sustainable Energy Reviews	61 (2016); p. 341-353.	22 indicators based on resource inputs, settlement dynamics, liveability, and waste outputs
Shen et al. 2011	The application of urban sustainability indicators – A comparison between various practices	Habitat International	35 (1); p. 17-29	37 indicators covering environmental, economic, social, and governance dimensions of sustainability
Hosseini and	Dynamic sustainability	Ecological	11 (3); p.	29 indicators covering

Kaneko 2011	assessment of countries at the macro level: A principal component analysis	Indicators	811-823	environmental, economic, social, and institutional dimensions of sustainability
Michael et al. 2014 (citing Urban Indicators Guidelines 2013)	Review of urban sustainability indicators- Case study between Asian countries	Habitat International	44; p. 491-500	42 sustainability indicators
Wu 2014	Urban ecology and sustainability: The state-of-the-science and future directions	Landscape and Urban Planning	125; p. 209-221	15 indicators representing the environment-economy-society nexus

Appendix 2: Questionnaire for field survey.

Appendix 2A. Information and consent sheet for survey participants.

CITY…….
ID:…….

LOCAL:……

Researcher: Kwasi Peprah Anarfi
Bournemouth University
Fern Barrow, Poole BH12 5BB, UK

kanarfi@bournemouth.ac.uk

INFORMATION AND CONSENT SHEET FOR SURVEY PARTICIPANTS

PROJECT TOPIC: 'An African perspective on urban sustainability: a comparative study of two urban areas in Ghana'.

This information sheet provides information about a survey for a research project that you are invited to participate in, on urbanisation and the transition towards sustainable cities. This survey is being undertaken Kwasi Peprah Anarfi, a PhD student at Bournemouth University, UK. Your participation will help throw light on the nature of urbanisation in Sub-Saharan Africa and help make informed contributions which will potentially steer the urbanisation process towards a desired status of urban sustainability. The information from this survey will be confidential and used solely for academic purposes. Participation in this survey is entirely voluntary and the respondent may withdraw at any time without giving a reason for doing so.

1. PURPOSE OF STUDY

The study examines the nature of urbanisation in the study locations and to explore ways of transforming urban systems towards sustainability.

2. CHOICE OF PARTICIPANTS

The study involves seeking views from urban residents on issues in concerning urbanisation, the dimensions of sustainable development and urban sustainability.

3. CONSENT

a) The investigator has explained the purpose and nature of the research to me.

b) My doubts and questions have been answered satisfactorily.

c) I agree to participate based on assurances that I can voluntarily withdraw from the research without any problems.

Signature: Date:

Appendix 2B. Questionnaire.

Part A: Demographic data

1. Gender	Male [ ] Female [ ]
2. Age (in years)	18-30 [ ] 31-45 [ ] 46-60 [ ] >60 [ ]
3. Length of Residence (yrs)	<2 [ ] 2-5 [ ] 6-10 [ ] > 10 [ ]
4. Level of Education	None [ ] Primary [ ] Secondary [ ] Tertiary [ ]
5. Employment Status	Employed with wage [ ] Self-employed [ ] Unemployed / Retired [ ]
6. Housing	Home Owner [ ] Tenant [ ] Family / Friends Housing [ ]
7. Household Size	

Part B: Perspectives on Dimensions of sustainability

Please indicate your level of agreement with the following statements:

Q.	***Economic Sustainability***	**Strongly Agree**	**Agree**	**Undecided**	**Disagree**	**Strongly Disagree**
8	It is easy to find a job.	1	2	3	4	5
9	The cost of goods and services are acceptable (compared to elsewhere in Ashanti)	1	2	3	4	5
10	Income levels are adequate (compared to elsewhere in Ashanti)	1	2	3	4	5

Q.	***Social Sustainability***	**Strongly Agree**	**Agree**	**Undecided**	**Disagree**	**Strongly Disagree**
11	Access to education is adequate	1	2	3	4	5

12	Access to healthcare is adequate	1	2	3	4	5
13	Access to housing is adequate	1	2	3	4	5
14	Public transport is widely available	1	2	3	4	5
15	Public safety levels are acceptable	1	2	3	4	5

Q.	***Environmental Sustainability***	**Strongly Agree**	**Agree**	**Undecided**	**Disagree**	**Strongly Disagree**
16	The level of air quality/ pollution is acceptable.	1	2	3	4	5
17	The amount of accessible green and public spaces is adequate.	1	2	3	4	5
18	The level of sanitation service provision and general cleanliness are adequate	1	2	3	4	5
19	There is good access to potable water	1	2	3	4	5
20	Recycling/ re-use of waste materials are important to save the environment.	1	2	3	4	5

Part C: Perspectives on Urbanisation

Please indicate your level of agreement with the following statements:

Q.		**Strongly Agree**	**Agree**	**Undecided**	**Disagree**	**Strongly Disagree**
21	The city's population and landscape are changing rapidly.	1	2	3	4	5
22	The rate of urbanisation is commensurate with the level of development.	1	2	3	4	5

23	There is great access to economic opportunities, essential infrastructure and services from where I live in this city.	1	2	3	4	5
24	I am happy to live in this city and I personally do not seek to migrate to another place in this country.	1	2	3	4	5

Part D: Attitudes towards urban sustainability

Please indicate your level of agreement with the following statements:

Q.		**Yes**	**Maybe**	**No**
25	Would you willingly participate in a waste recycling scheme in order to promote sustainability in this city?	1	2	3
26	Would you willingly patronise means of transport like cycling and public transport provided they are safe, easily accessible and convenient, in order to promote sustainability in this city?	1	2	3
27	Would you willingly regulate direct water use in your household in order to promote sustainability in this city?	1	2	3
28	Would you willingly regulate direct energy use in your household in order to promote sustainability in this city?	1	2	3

Further comments:

……
……
…….....
.....
.....
.....

Thank you.

Appendix 3: Selected responses from 'further comments' section of questionnaire.

Table A3.1 Summary of selected responses from further comments section of questionnaire.

Location	ID	Comment
Obuasi	***O107***	*"The government must come to our aid. We have no jobs and the future looks bleak"*
	O304	*"I used to engage in 'galamsey' but there has been a clamp down by the government and the company (AngloGold Ashanti) due to environmental concerns and the fact that the land belongs to the company. But what should we do since there are no jobs? I know 'galamsey' destroys the land and water (environment) but what choice do have when 'galamsey' is the only means through which we can survive" (Author's field study).*
	O341	*"I am currently studying, but in the future, I think, I would love to move to Kumasi or Accra where I can find a good paying job to secure my future"*
	O349	*"I am not happy with my quality of life. Things have been hard since company halted operations. As a trader, people are not purchasing my items because there is no money"*
	O425	*"They (government and AngloGold Ashanti)) say they will not allow us to engage in "galamsey" because it destroys the land. But I was born here and within my lifetime I have seen the company's mining operation destroy our river. What did they do about it then? Galamsey is risky, but people still want to do it because that's how they can get money to cater for their families".*
	O511	*"If I understand you well, you want to know whether we are happy with the level of development we are experiencing. I will ask you to look around, just look at the pot holes on the roads, the population is growing but the infrastructure has not changed significantly".*
	K115	*"I think Kumasi is the most cosmopolitan city in Ghana as many people from different tribes of the country have come here. But where are the jobs?*

Kumasi	***K321***	*"The last few years were uncomfortable as the energy (electricity) rationing was going on. So, the government must find a way to educate citizens to save energy"*
	K325	*"Kumasi has changed considerably over the years. I think it the city has exhausted the capacity of the people it can accommodate"*
	K727	*"I understand the fact that you are sensitising us on the things we could do to promote good development. However, if we want to recycle our waste where do we send it? We can only do it if adequate provisions are made. These days, in order to be able to go to work you must buy a car if you can afford it. The 'trotro' (public transport) is unreliable and you spend a lot time waiting it".*
	K406	*"The population has increased but I do not think the government is doing enough. I am moving houses almost every two years because landlords are increasing rent at every tenancy renewal period"*
	K 519	*"If the government does not put in place good policies to enhance the performance of the economy and create jobs for the up and coming youth, then our future will be hopeless"*
	K702	*"The number of public recreational places in a big city like Kumasi is woefully inadequate. In fact,*
	K322	*"The government must help us else we are going to die poor. It's been three years since I completed SSS (senior high school), yet I cannot find a job, neither can I afford to continue my school".*
	K118	*"People (researchers, government etc) are always soliciting for information on our development circumstances and almost every time I have to narrate the same story. Our economic circumstances are not great and we are fighting to make ends meet"*

Appendix 4: Confusion matrices for accuracy assessment of classified land cover maps.

Table A4.1. Confusion matrix for land cover classification in Kumasi for 1986. Kappa=0.78.

Mapped Class	**Reference points**						
	Water	**Urban / Built-up**	**Mixed Vegetation**	**Forest**	**Agricultural land**	**Total**	**User Accuracy (%)**
Water	9	0	0	0	1	10	90
Urban / Built-up	0	16	2	0	3	21	76
Mixed Vegetation	0	0	16	2	2	20	80
Forest	1	0	0	9	1	11	82
Agricultural Land	0	1	0	0	6	7	86
Total	10	17	18	11	13	**69**	
Producer Accuracy (%)	90	94	89	82	46.1	**Overall Accuracy = 82%**	

Table A4.2. Confusion matrix for land cover classification in Kumasi for 2000. Kappa=0.81.

Mapped Class	**Reference points**						
	Water	**Urban / Built-up**	**Mixed Vegetation**	**Forest**	**Agricultural land**	**Total**	**User Accuracy (%)**
Water	5	0	0	0	0	5	100
Urban / Built-up	0	22	2	0	1	25	88
Mixed Vegetation	0	1	7	1	0	9	78
Forest	0	0	1	4	0	5	80
Agricultural Land	0	2	0	2	14	18	78
Total	5	25	10	7	15	**62**	
Producer Accuracy (%)	100	88	70	57	93	**Overall Accuracy = 84%**	

Table 4.3. Confusion matrix for land cover classification in Kumasi for 2010. Kappa=0.86.

Mapped Class	**Reference points**						
	Water	**Urban / Built-up**	**Mixed Vegetation**	**Forest**	**Agricultural land**	**Total**	**User Accuracy (%)**
Water	5	0	0	0	0	5	100
Urban / Built-up	0	20	0	0	2	22	91
Mixed Vegetation	0	0	7	0	0	7	100
Forest	0	0	0	8	1	9	89
Agricultural Land	0	1	0	0	9	10	90
Total	5	21	8	8	11	**53**	
Producer Accuracy (%)	100	91	88	100	82	**Overall Accuracy = 92%**	

Table A4.4. Confusion matrix for land cover classification in Kumasi for 2018. Kappa=0.83.

Mapped Class	**Reference points**						
	Water	**Urban / Built-up**	**Mixed Vegetation**	**Forest**	**Agricultural land**	**Total**	**User Accuracy (%)**
Water	1	0	0	0	0	1	100
Urban / Built-up	0	8	1	0	0	9	89
Mixed Vegetation	0	0	10	0	0	10	100
Forest	0	0	0	5	0	5	100
Agricultural Land	0	1	1	0	3	5	60
Total	1	9	12	5	3	**30**	
Producer Accuracy (%)	100	89	83	100	100	**Overall Accuracy = 90%**	

Table A4.5. Confusion matrix for land cover classification in Obuasi for 1986. Kappa=0.81.

Mapped Class	**Reference points**								
	Water	**Urban / Built-up**	**Mixed Vegetation**	**Forest**	**Agricultural land**	**Bare ground**	**Mine site**	**Total**	**User Accuracy (%)**
Water	-	-	-	-	-	-	-	-	-
Urban / Built-up	-	9	0	0	1	-	0	10	90
Mixed Vegetation	-	0	11	1	1	-	0	13	85
Forest	0	0	1	9	0	-	0	10	90
Agricultural Land	-	1	1	0	8	-	0	10	80
Bare ground	-	-	-	-	-	-	-	-	-
Mine site	-	1	0	0	0	-	4	5	80
Total	-	11	13	10	10	-	4	**48**	
Producer Accuracy (%)	-	82	85	90	80	-	100	**Overall Accuracy = 85%**	

Table A4.6. Confusion matrix for land cover classification in Obuasi for 2000. Kappa=0.76.

Mapped Class	**Reference points**								
	Water	**Urban / Built-up**	**Mixed Vegetation**	**Forest**	**Agricultural land**	**Bare ground**	**Mine site**	**Total**	**User Accuracy (%)**
Water	1	0	0	0	0	-	0	1	100
Urban / Built-up	0	13	0	0	2	-	0	15	87
Mixed Vegetation	0	1	10	2	2	-	0	15	67
Forest	0	0	0	5	0	-	0	5	100
Agricultural Land	0	0	1	0	4	-	0	5	80
Bare ground	-	-	-	-	-	-	-	-	-
Mine site	0	1	0	0	0	-	4	5	80
Total	1	15	11	7	8	-	4	**46**	
Producer Accuracy (%)	100	87	91	71	50	-	100	**Overall Accuracy = 80%**	

Table A4.7. Confusion matrix for land cover classification in Obuasi for 2010. Kappa=0.68

Mapped Class	Reference points								
	Water	**Built-up**	**Mixed Vegetation**	**Forest**	**Agriculture land**	**Bare ground**	**Mining**	**Total**	**User Accuracy (%)**
Water	1	0	0	0	0	0	0	1	100
Built-up	0	13	0	0	2	0	0	15	87
Mixed Vegetation	0	0	8	5	2	0	0	15	53
Forest	0	0	1	4	0	0		5	80
Agriculture Land	0	0	1	1	8	0	0	10	80
Bare ground	0	0	0	0	0	2	0	2	100
Mining	0	0	0	0	0	0	5	5	100
Total	1	13	10	10	12	2	5	**53**	
Producer Accuracy (%)	100	100	80	40	67	100	100	**Overall Accuracy = 77%**	

Table A4.8. Confusion matrix for land cover classification in Obuasi for 2018. Kappa=0.79.

Mapped Class	**Reference points**								
	Water	**Urban / Built-up**	**Mixed Vegetation**	**Forest**	**Agricultural land**	**Bare ground**	**Mine site**	**Total**	**User Accuracy (%)**
Water	2	0	0	0	0	-	0	2	100
Urban / Built-up	0	8	0	0	1	-	0	9	89
Mixed Vegetation	0	0	4	1	0	-	0	5	80
Forest	0	0	1	4	0	-	0	5	80
Agricultural Land		1	0	0	4	-	0	5	80
Bare ground	-	-	-	-	-	-	-	-	-
Mine site	1	0	0	0	0	-	3	4	75
Total	3	9	5	5	5	-	3	**30**	
Producer Accuracy (%)	67	89	80	80	80	-	100	**Overall Accuracy = 83%**	

Appendix 5: LULC change matrices for Kumasi and Obuasi, 1986–2018.

Table A5.1. LULC change matrix for Kumasi 1986–2000.

	LULC Class	**Kumasi 2000 (Area in km^2)**					
		Water	**Urban / Built-up**	**Mixed Woody Vegetation**	**Forest**	**Agricultural land**	**Grand Total 1986**
Kumasi 1986	*Water*	**0.50**	0.00	0.00	0.00	0.00	0.50
	Urban / Built-up	0.00	**42.76**	0	0	0.47	43.23
	Mixed Woody Vegetation	0.21	125.25	**106.88**	1.15	395.27	628.76
	Forest	0	2.51	69.00	**3.27**	3.33	78.11
	Agricultural Land	0.25	62.40	0.46	0	**1.64**	64.75
	Grand Total 2000	0.96	232.92	176.34	4.42	400.71	815.35

Table A5.2. LULC change matrix for Kumasi 2000–2010.

	LULC Class	**Kumasi 2010 (Area in km^2)**					
		Water	**Urban / Built-up**	**Mixed Woody Vegetation**	**Forest**	**Agricultural land**	**Grand Total 2000**
Kumasi 2000	*Water*	**0.96**	0	0	0	0	0.96
	Urban / Built-up	0	**232.81**	0	0	0.11	232.92
	Mixed Woody Vegetation	0	39.50	**44.11**	1.61	91.12	176.34
	Forest	0	0.13	1.24	**1.84**	1.21	4.42
	Agricultural Land	0	117.79	1.22	0.18	**281.52**	400.71
	Grand Total 2010	0.96	390.23	46.57	3.63	373.96	815.35

Table A5.3. LULC change matrix for Kumasi 2010–2018.

	LULC Class	**Kumasi 2018 (Area in km^2)**					
		Water	**Urban / Built-up**	**Mixed Woody Vegetation**	**Forest**	**Agricultural land**	**Grand Total 2010**
Kumasi 2010	*Water*	**0.67**	0.27	0	0	0.02	0.96
	Urban / Built-up	0	**390.23**	0	0	0	390.23
	Mixed Woody Vegetation	0	5.89	**30.98**	2.36	7.34	46.57
	Forest	0	0	0.38	**2.91**	0.34	3.63
	Agricultural Land	0	112.81	81.99	68.31	**110.85**	373.96
	Grand Total 2018	0.67	509.20	113.35	73.58	118.55	815.35

Table A5.4. LULC change matrix for Obuasi 1986–2000.

	LULC Class	**Obuasi 2000 (Area in km^2)**							
		Water	**Urban / Built-up**	**Mixed Woody Vegetation**	**Forest**	**Agricultural land**	**Bare ground**	**Mine site**	**Grand Total 1986**
Obuasi 1986	*Water*	-	-	-	-	-	-	-	-
	Urban / Built-up	0	**23.51**	0	0	0.09	0	0	23.60
	Mixed Woody Vegetation	0	2.17	**147.87**	6.94	3.72	-	0.86	161.56
	Forest	0	1.61	8.01	**45.09**	3.43	-	0.02	58.16
	Agricultural Land	0.07	8.42	27.10	18.05	**72.35**	-	0.65	126.64
	Bare ground	-	-	-	-	-	-	-	-
	Mining	0	0.91	6.43	0	0.54	-	**2.67**	10.55
	Grand Total 2000	0.07	36.62	189.41	70.08	80.13	-	4.20	380.51

Table A5.5. LULC change matrix for Obuasi 2000–2010.

	LULC Class	Obuasi 2010 (Area in km^2)							
		Water	**Urban / Built-up**	**Mixed Woody Vegetation**	**Forest**	**Agricultural land**	**Bare ground**	**Mine site**	**Grand Total 2000**
Obuasi 2000	*Water*	**0.07**	0	0	0	0	0	0	0.07
	Urban / Built-up	0	**36.62**	0	0	0	0	0	36.62
	Mixed Woody Vegetation	0.92	2.51	**71.03**	64.31	39.38	2.75	8.51	189.41
	Forest	0	1.10	3.56	**51.98**	11.47	0	1.97	70.08
	Agricultural Land	0.21	6.27	1.25	2.75	**58.45**	7.85	2.57	80.13
	Bare ground	-	-	-	-	-	-	-	-
	Mining	0	0	0.22	0	0	0.50	**3.48**	4.20
	Grand Total 2010	1.20	46.50	76.06	119.04	110.03	11.15	16.53	380.51

Table A5.6. LULC change matrix for Obuasi 2010–2018.

	LULC Class	Obuasi 2018 (Area in km^2)							
		Water	**Urban / Built-up**	**Mixed Woody Vegetation**	**Forest**	**Agricultural land**	**Bare ground**	**Mine site**	**Grand Total 2010**
Obuasi 2010	*Water*	**0.07**	0.92	0	0	0.21	0	0	1.20
	Urban / Built-up	0	**46.48**	0	0	0.02	-	0	46.50
	Mixed Woody Vegetation	0	2.91	**65.29**	2.21	5.27	-	0.38	76.06
	Forest	0	0.36	43.25	**68.7**	5.51	-	1.22	119.04
	Agricultural Land	0	2.95	5.98	0.64	**99.30**	-	1.16	110.03
	Bare ground	0	4.06	0.66	0	6.31	-	0.12	11.15
	Mining	0	0	2.34	0	10.21	-	**3.98**	16.53
	Grand Total 2018	0.07	57.68	117.52	71.55	126.83	-	6.86	380.51

Appendix 6: Maps showing Built-up vs Non-built-up land cover in Kumasi and Obuasi.

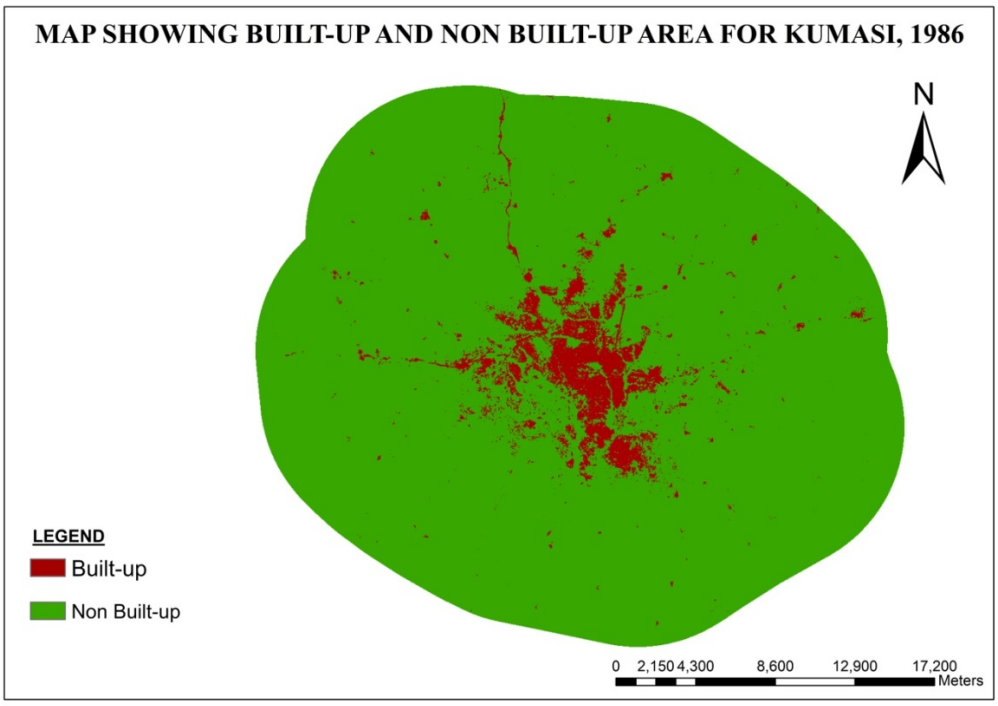

Figure A6.1: Built-up vs Non-Built-up land cover in Kumasi, 1986.

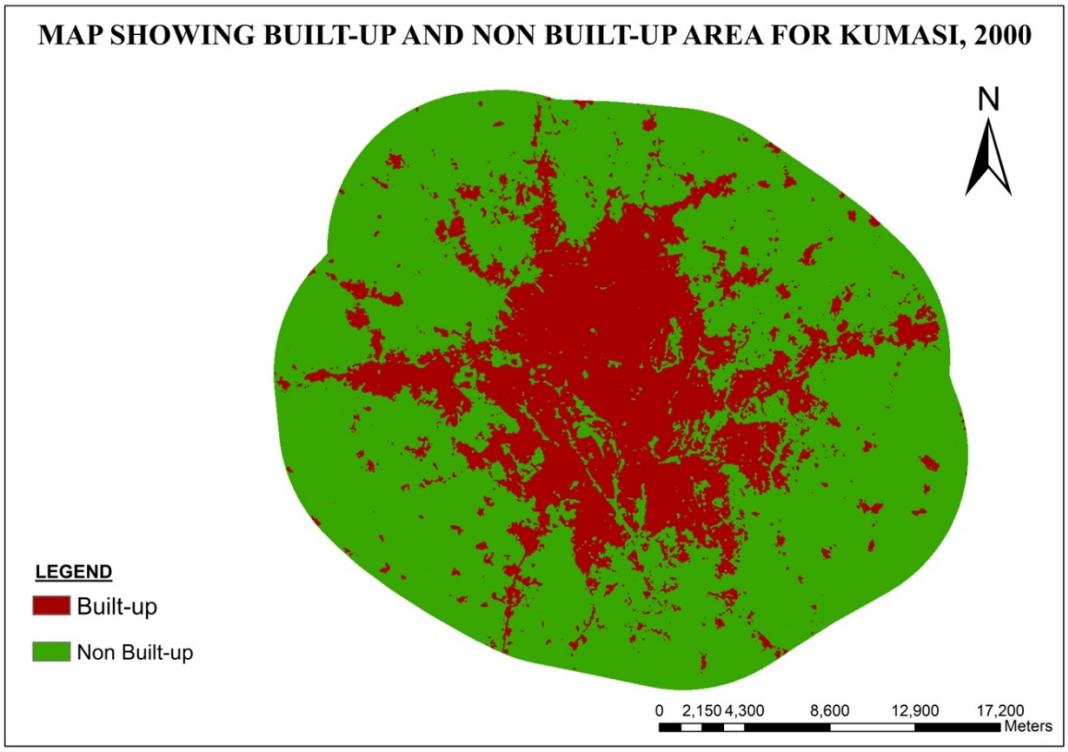

Figure A6.2: Built-up vs Non-Built-up land cover in Kumasi, 2000.

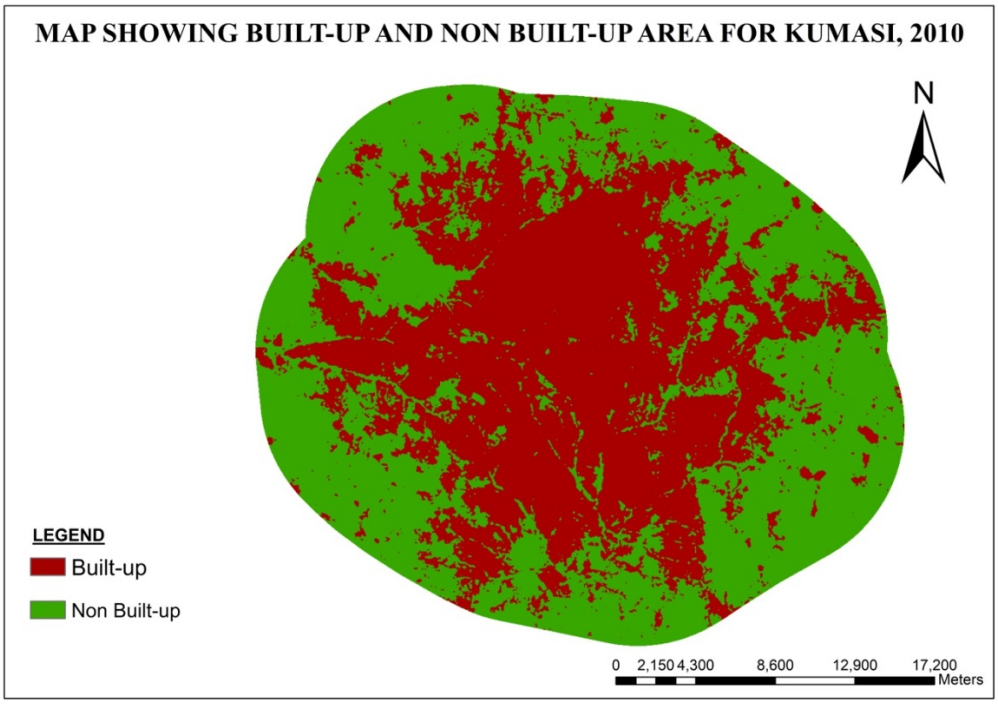

Figure 6.3: Built-up vs Non-Built-up land cover in Kumasi, 2010.

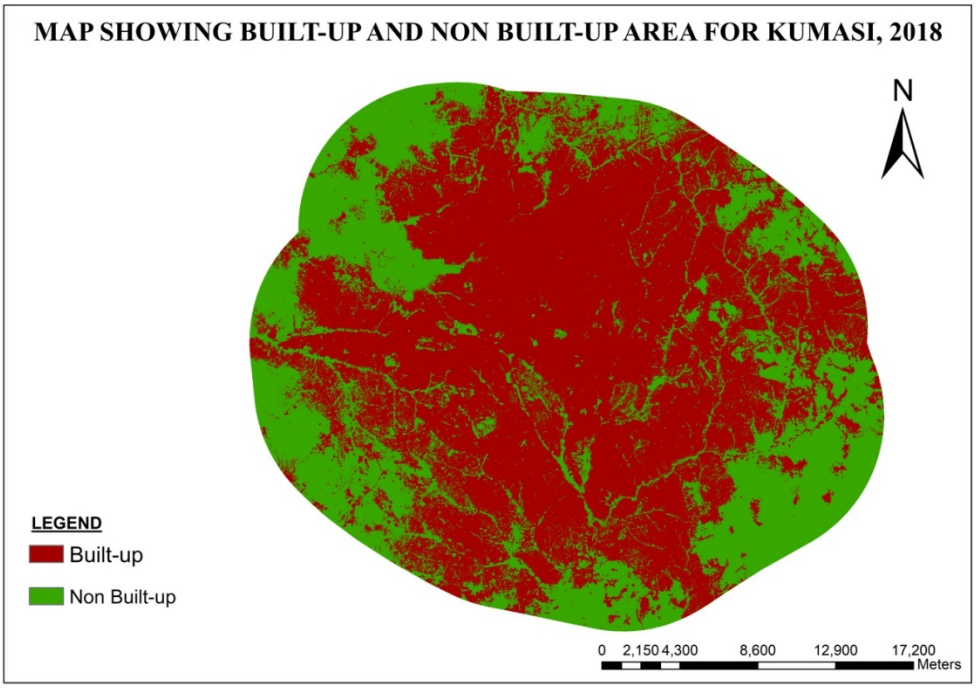

Figure A6.4: Built-up vs Non-Built-up land cover in Kumasi, 2018.

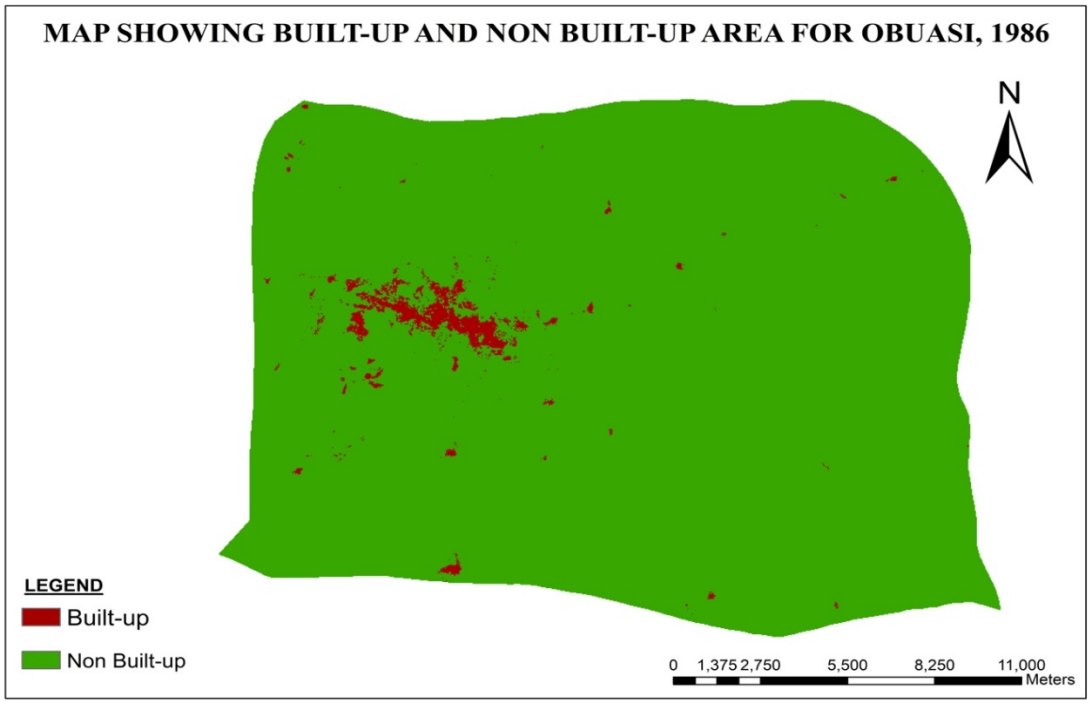

Figure A6.5: Built-up vs Non-Built-up land cover in Obuasi, 1986.

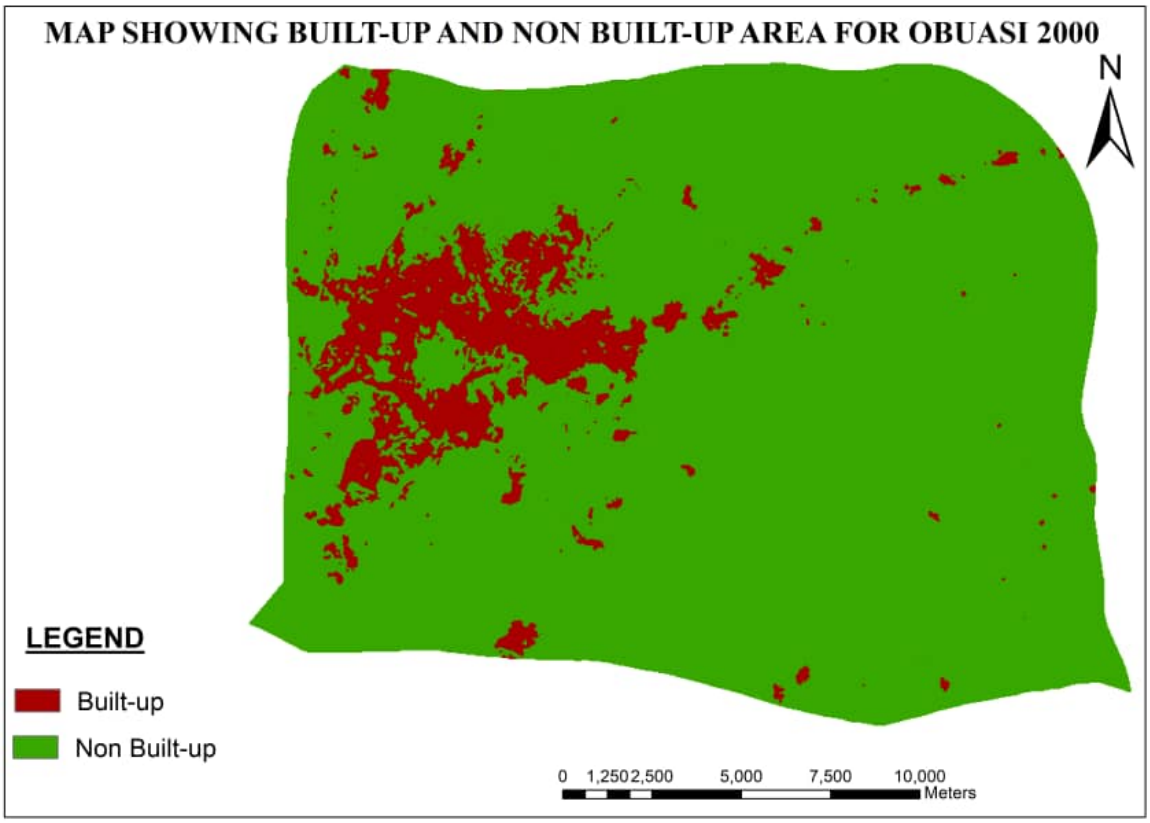

Figure A6.6: Built-up vs Non-Built-up land cover in Obuasi, 2000.

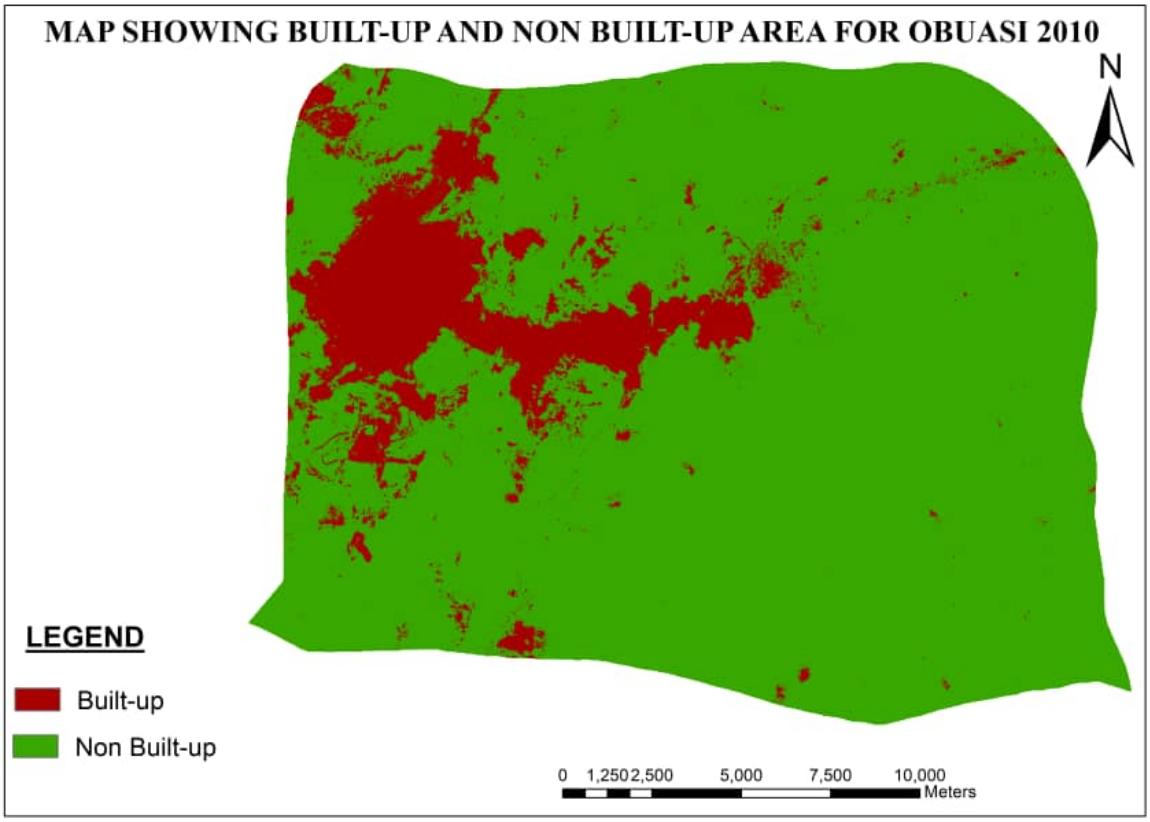

Figure A6.7: Built-up vs Non-Built-up land cover in Obuasi, 2010.

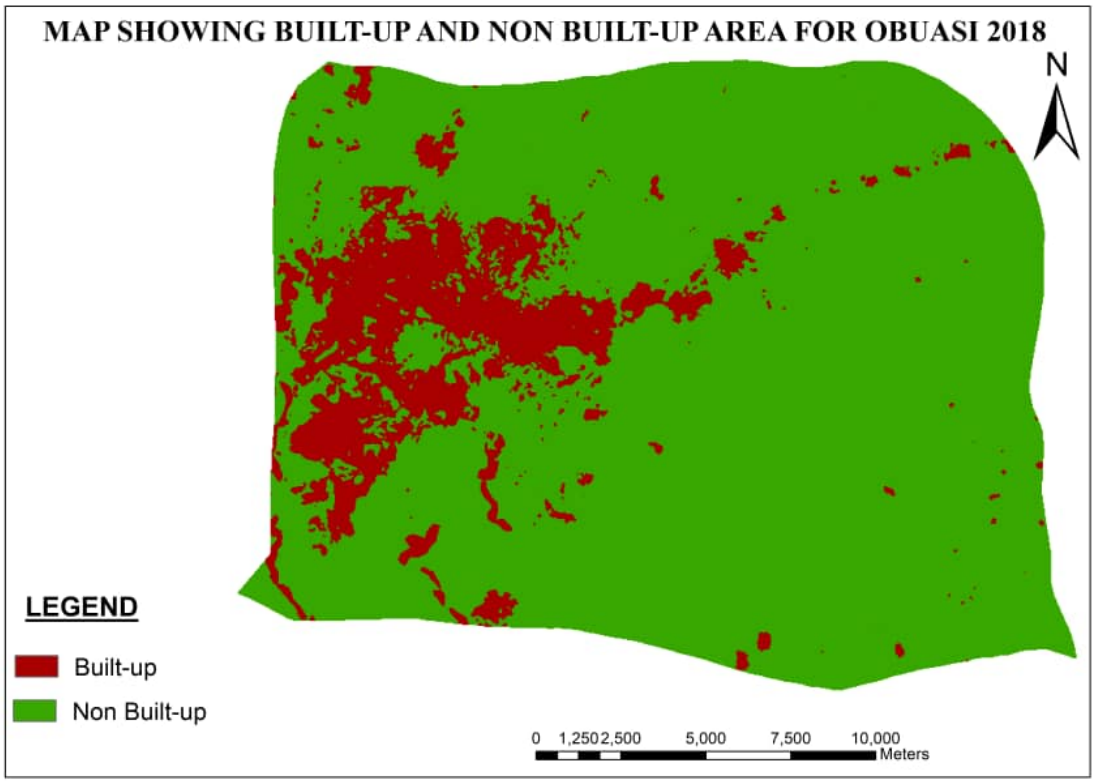

Figure A6.8: Built-up vs Non-Built-up land cover in Obuasi, 2018.

Appendix 7: Statistics showing which economic groups were causing group differences in Kruskal Wallis H test for Kumasi.

Table A7.1. Table showing ranks between 'Employed with wage' and 'Self-employed' in Kumasi

Ranks			
	Employment Status	N	Mean Rank
It is easy to find a job.	Employed with wage	47	99.24
	Self-employed	145	95.61
	Total	192	
The cost of goods and services are acceptable (compared to elsewhere in Ashanti)	Employed with wage	47	86.13
	Self-employed	145	99.86
	Total	192	

Table A7.2. Table showing test statistics between 'Employed with wage' and 'Self-employed' in Kumasi.

Test Statistics[a,b]		
	It is easy to find a job.	The cost of goods and services are acceptable (compared to elsewhere in Ashanti)
Kruskal-Wallis H	.209	2.463
df	1	1
Asymp. Sig.	.648	.117
a. Kruskal Wallis Test		
b. Grouping Variable: Employment Status		

Table A7.3. Table showing ranks between 'Self-employed' and 'Unemployed in Kumasi.

Ranks			
	Employment Status	N	Mean Rank
It is easy to find a job.	Self-employed	145	158.40
	Unemployed/Retired	126	110.22
	Total	271	
The cost of goods and services are acceptable (compared to elsewhere in Ashanti)	Self-employed	145	149.47
	Unemployed/Retired	126	120.50
	Total	271	

Table A7.4. Table showing test statistics between 'Self-employed' and 'Unemployed' in Kumasi.

Test Statistics[a,b]		
	It is easy to find a job.	The cost of goods and services are acceptable (compared to elsewhere in Ashanti)
Kruskal-Wallis H	32.688	10.918
df	1	1
Asymp. Sig.	.000	.001
a. Kruskal Wallis Test		
b. Grouping Variable: Employment Status		

Table A7.5. Table showing ranks between 'Employed with wage'' and 'Unemployed in Kumasi.

Ranks			
	Employment Status	N	Mean Rank
It is easy to find a job.	Employed with wage	47	112.83
	Unemployed/Retired	126	77.37
	Total	173	
The cost of goods and services are acceptable (compared to elsewhere in Ashanti)	Employed with wage	47	91.10
	Unemployed/Retired	126	85.47
	Total	173	

Table A7.6. Table showing test statistics between 'Employed with wage' and 'Unemployed' in Kumasi.

Test Statistics[a,b]		
	It is easy to find a job.	The cost of goods and services are acceptable (compared to elsewhere in Ashanti)
Kruskal-Wallis H	22.393	.565
df	1	1
Asymp. Sig.	.000	.452
a. Kruskal Wallis Test		
b. Grouping Variable: Employment Status		

Appendix 8: Statistics showing which economic groups were causing group differences in Kruskal Wallis H test for Obuasi.

Table A8.1. Table showing ranks between 'Employed with wage' and 'Self-employed' in Obuasi.

Ranks			
	Employment Status	N	Mean Rank
It is easy to find a job.	Employed with wage	51	114.09
	Self-employed	131	82.71
	Total	182	
There is great access to economic opportunities, essential infrastructure and services from where I live in this city.	Employed with wage	51	90.38
	Self-employed	131	91.94
	Total	182	

Table A8.2. Table showing test statistics between 'Employed with wage' and 'Self-employed' in Obuasi.

Test Statistics[a,b]		
	It is easy to find a job.	There is great access to economic opportunities, essential infrastructure and services from where I live in this city.
Kruskal-Wallis H	19.400	.037
df	1	1
Asymp. Sig.	.000	.847
a. Kruskal Wallis Test		
b. Grouping Variable: Employment Status		

Table A8.3. Table showing ranks between 'Self-employed' and 'Unemployed in Obuasi.

Ranks			
	Employment Status	N	Mean Rank
It is easy to find a job.	Self-employed	131	136.35
	Unemployed/Retired	120	114.70
	Total	251	
There is great access to economic opportunities, essential infrastructure and services from where I live in this city.	Self-employed	131	138.25
	Unemployed/Retired	120	112.63
	Total	251	

Table A8.4. Table showing test statistics between 'Self-employed' and 'Unemployed' in Obuasi.

Test Statistics[a,b]		
	It is easy to find a job.	There is great access to economic opportunities, essential infrastructure and services from where I live in this city.
Kruskal-Wallis H	9.083	8.948
df	1	1
Asymp. Sig.	.003	.003
a. Kruskal Wallis Test		
b. Grouping Variable: Employment Status		

Table A8.5. Table showing ranks between 'Employed with wage'' and 'Unemployed in Obuasi.

Ranks			
	Employment Status	N	Mean Rank
It is easy to find a job.	Employed with wage	51	114.29
	Unemployed/Retired	120	73.98
	Total	171	
There is great access to economic opportunities, essential infrastructure and services from where I live in this city.	Employed with wage	51	98.51
	Unemployed/Retired	120	80.68
	Total	171	

Table A8.6. Table showing test statistics between 'Employed with wage' and 'Unemployed' in Obuasi.

Test Statistics[a,b]		
	It is easy to find a job.	There is great access to economic opportunities, essential infrastructure and services from where I live in this city.
Kruskal-Wallis H	31.772	5.504
df	1	1
Asymp. Sig.	.000	.019
a. Kruskal Wallis Test		
b. Grouping Variable: Employment Status		

Appendix 9: Statistics showing which age groups were causing significant interactions in Kruskal Wallis H test for Kumasi.

Table A9.1. Table showing ranks between '18-30' and '31-45' in Kumasi

Ranks			
	Age (in years)	N	Mean Rank
I am happy to live in this city and I personally do not seek to migrate to another place in this country.	18 - 30	139	114.10
	31 - 45	113	141.75
	Total	252	

Table A9.2. Table showing test statistics between '18-30' and '31-45' in Kumasi.

Test Statistics[a,b]	
	I am happy to live in this city and I personally do not seek to migrate to another place in this country.
Kruskal-Wallis H	9.707
df	1
Asymp. Sig.	.002
a. Kruskal Wallis Test	
b. Grouping Variable: Age (in years)	

Table A9.3. Table showing ranks between '18-30' and '46-60' in Kumasi

Ranks			
	Age (in years)	N	Mean Rank
I am happy to live in this city and I personally do not seek to migrate to another place in this country.	18 - 30	139	82.83
	46 - 60	51	130.04
	Total	190	

Table A9.4. Table showing test statistics between '18-30' and '46-60' in Kumasi.

Test Statistics[a,b]	
	I am happy to live in this city and I personally do not seek to migrate to another place in this country.
Kruskal-Wallis H	29.515
df	1
Asymp. Sig.	.000
a. Kruskal Wallis Test	
b. Grouping Variable: Age (in years)	

Table A9.5. Table showing ranks between '18-30' and '>60' in Kumasi

Ranks			
	Age (in years)	N	Mean Rank
I am happy to live in this city and I personally do not seek to migrate to another place in this country.	18 - 30	139	71.51
	>60	15	133.03
	Total	154	

Table A9.6. Table showing test statistics between '18-30' and '>60' in Kumasi.

Test Statistics[a,b]	
	I am happy to live in this city and I personally do not seek to migrate to another place in this country.
Kruskal-Wallis H	27.813
df	1
Asymp. Sig.	.000
a. Kruskal Wallis Test	
b. Grouping Variable: Age (in years)	

Table A9.7. Table showing ranks between '31-45' and '46-60' in Kumasi.

Ranks			
	Age (in years)	N	Mean Rank
I am happy to live in this city and I personally do not seek to migrate to another place in this country.	31 - 45	113	74.70
	46 - 60	51	99.78
	Total	164	

Table A9.8. Table showing test statistics between '31-45' and '46-60' in Kumasi.

Test Statistics[a,b]	
	I am happy to live in this city and I personally do not seek to migrate to another place in this country.
Kruskal-Wallis H	10.708
df	1
Asymp. Sig.	.001
a. Kruskal Wallis Test	
b. Grouping Variable: Age (in years)	

Table A9.9. Table showing ranks between '31-45' and '>60' in Kumasi.

Ranks			
	Age (in years)	N	Mean Rank
I am happy to live in this city and I personally do not seek to migrate to another place in this country.	31 - 45	113	59.35
	>60	15	103.33
	Total	128	

Table A9.10. Table showing test statistics between '31-45' and '>60' in Kumasi.

Test Statistics[a,b]	
	I am happy to live in this city and I personally do not seek to migrate to another place in this country.
Kruskal-Wallis H	20.184
df	1
Asymp. Sig.	.000
a. Kruskal Wallis Test	
b. Grouping Variable: Age (in years)	

Table A9.11. Table showing ranks between '46-60' and '>60' in Kumasi.

Ranks			
	Age (in years)	N	Mean Rank
I am happy to live in this city and I personally do not seek to migrate to another place in this country.	46 - 60	51	30.20
	>60	15	44.73
	Total	66	

Table A9.12. Table showing test statistics between '46-60' and '>60' in Kumasi.

Test Statistics[a,b]	
	I am happy to live in this city and I personally do not seek to migrate to another place in this country.
Kruskal-Wallis H	7.744
df	1
Asymp. Sig.	.005
a. Kruskal Wallis Test	
b. Grouping Variable: Age (in years)	